

## Bachelor of Applied Technology Biotechnology

A Four-Year Ontario Bachelor of Applied Technology and Co-op Program

1001 Fanshawe College Blvd. – Room D1063  
London, ON N5Y 5R6  
Phone: 519-452-4294 Fax: 519-452-4572  
coop@fanshawec.ca



### The Program

This program prepares graduates for jobs or further education in Biotechnology. The burgeoning areas of pharmaceutical and natural source development, agriculture, bioremediation, the fermentation industry, scientific research and development offer a multitude of opportunities. Students study molecular biology, applied biotechnology, microbiology, virology, toxicology and related societal economic, ethical, legal and environmental issues. Throughout the program, students apply university-level theory to practical applications.

### The Content

Students learn practical skills in areas of biotechnology that range from biology, microbiology and genetics to law, communications, ethics and environmental safety and impact. The burgeoning area of bioinformatics –and database analysis directly related to biotechnology – also figure prominently in the program.

### The Outcomes

Graduates of this program have the opportunity to pursue a wide variety of Master's level programs, post graduate certifications and teacher's college. Employment opportunities exist in a wide variety of areas associated with the Biotechnology sector. These include research and product development, laboratory management, agricultural product development, quality control in many sectors, chemical and microbiology analysis in the food and beverage industry, fermentation chemistry, environmental remediation, alternate energy source development, pharmaceutical production and sales, downstream processing of waste products, project management, forensic analysis, risk assessment and management, intellectual property manager and technical writing.

### Sample Co-op Progression Charts:

September Intake Only			
	Fall	Winter	Summer
<b>Year 1</b>	Academic Term 1	Academic Term 2	Off
<b>Year 2</b>	Academic Term 3	Academic Term 4	Work Term 1
<b>Year 3</b>	Work Term 5	Academic Term 6	Work Term 2
<b>Year 4</b>	Academic Term 7	Academic Term 8	



## **Learning Outcomes:**

### **1. Perform all laboratory tasks according to accepted laboratory practices.**

- Perform QA / QC tests to ensure the validity of experimental data
- Recognize health and safety issues associated with all laboratory work including designated biohazardous material
- Collect, record and archive all data in a manner which facilitates easy retrieval
- Culture bacterial, plant and animal cells and prepare growth media
- Handle, care for, manage and monitor samples
- Re-design experimental based on preliminary results and assessments

### **2. Demonstrate theoretical and practical skills in molecular biology.**

- Apply laboratory techniques to various types of electrophoresis and chromatography
- Perform laboratory procedures using analytical instruments such as HPLC, GCMS and LC-MSD
- Isolate DNA and RNA
- Perform DNA amplification (PCR)
- Perform Genetic Mapping experiments (RFLP)
- Explain concepts and procedures relevant to proteomic analysis

### **3. Assist in the design of good experimental and laboratory management practices and procedures.**

- Perform library and internet searches
- Interpret the work of others to develop hypotheses
- Develop strategies to test these hypotheses
- Select the appropriate instrumentation to perform specific functions

### **4. Obtain a sound practical background in the interdisciplinary subjects that are the basis of Biotechnology.**

- Incorporate and integrate interdisciplinary principles into Biotechnology research and writing

### **5. Perform all duties in a manner that adheres to the principles of good data management.**

- Apply a high level of recognized computer skills to data management and ensure its validity, accuracy and precision
- Utilize laboratory and bioinformatics software

### **6. Conduct all functions with a full understanding of and in adherence to relevant regulatory and ethical issues and requirements.**

- Adhere to all environmental, health & safety guidelines/regulations
- Assist in patent searches relating to Biotechnology
- Work within the legal protection afforded the intellectual property of others
- Adhere to the moral and ethical issues involved in research
- Recognize the importance of personal and corporate privacy issues

### **7. Apply procedures of bio-processing in both laboratory and industrial settings.**

- Perform separation and purification techniques
- Evaluate aerobic and anaerobic fermentation
- Describe the operation of bio-processing equipment such as bioreactors and biofilters

### **8. Understand, value and respect the diverse social, political, cultural and ethical context in which he or she will live and work.**

- Trace the historical development of scientific thought and attitudes
- Explore the ethical dilemmas inherent in biotechnological experimentation and the development of bio-engineering products
- Describe the impact of political climate, the media, social and cultural attitudes on Biotechnology
- Articulate the potential impact of Biotechnology initiatives on individual lives and the global community.
- Apply the breadth and depth gained from the study of a variety of fields and bodies of knowledge to his or her own life and work

### **9. Develop plans for lifelong learning that include strategies for ensuring professional and technological currency.**

- Identify the numerous work settings that incorporate Biotechnology
- Identify professional organizations that provide certification, professional development opportunities and current information in the field of Biotechnology and related fields of studies
- Develop a self-marketing portfolio in preparation for employment that reveals self-knowledge of strengths, weaknesses and goals

## Course Outline

For the official Degree Audit, please see Registrar's Office

**Level 1** – Take all of the following Mandatory Courses

Gen Ed – Take a 3 credit Gen. Ed. elective course

CHEM-7002 Chemistry I

COMM-7001 Introductory Communications

ENVR-7004 Environmental & World Issues

BIOL-7002 Molecular Biology

MATH-7002 Mathematics I

**Level 2** – Take all of the following Mandatory Courses

Gen Ed – Take a 3 credit Gen. Ed. elective course

CHEM-7003 Chemistry II

PHYS-7001 Physics I

HIST-7003 History & Philosophy of Sciences

BIOL-7003 Plant & Animal Anatomy & Physiology

**Level 3** – Take all of the following Mandatory Courses

CHEM-7004 Analytical Chemistry I

COMP-7002 Computers & Applications

PHYS-7005 Physics II

BIOL-7001 Microbiology I

WRIT-7001 Report Writing

COOP-1020 Co-op Ed. Employment Prep

**Level 4** – Take all of the following Mandatory Courses

Gen Ed – Take a 3 credit Gen. Ed. elective course

BIOL-7004 Genetics

PHYS-7003 Radiation Physics

MATH-7003 Mathematics II

SFTY-7001 Occupational Health & Safety

CHEM-7005 Organic Chemistry I

MATH-7004 Statistics & Quality Assurance

**Level 5** – Take all of the following Mandatory Courses

Gen Ed – Take a 3 credit Gen. Ed. elective course

COMP-7003 Advanced Computer Applications

CHEM-7006 Biochemistry I

CHEM-7007 Instrumental Chemistry Analysis I

BIOL-7005 Microbiology II – Industrial Applications

CHEM-7008 Organic Chemistry II

**Level 6** – Take all of the following Mandatory Courses

Gen Ed – Take a 3 credit Gen. Ed. elective course

ZOOL-7001 Animal Care & Handling

BIOL-7006 Applied Molecular Genetics

CHEM-7009 Instrumental Chemistry Analysis II

PHRM-7002 Pharmacology, Toxicology & Nutraceuical

COMM-7005 Research & Technical Writing

CHEM-7001 Biochemistry II



**Level 7** – Take all of the following Mandatory Courses

Gen Ed – Take a 3 credit Gen. Ed. elective course

CHEM-7010 Analytical Chemistry II

BIOL-7007 Applied Biotechnology I

BIOL-7008 Bioinformatics

ENGR-7001 Bioprocess Engineering

SFTY-7002 Biosafety & Regulatory Affair

COMM-7006 Thesis

**Level 8** – Take all of the following Mandatory Courses

Gen Ed – Take a 3 credit Gen. Ed. elective course

BIOL-7009 Applied Biotechnology II

BIOL-7010 Bioethics

BIOL-7011 Current Topics in Biotechnology

ECON-7002 Macroeconomics

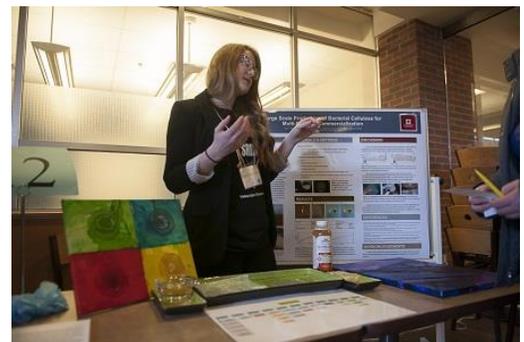
ENGR-7002 Manufacturing Process Engineering

BIOL-7012 Microbiology III (Immunology & Virology)

### Requirements:

- Must complete one co-op work term
- Take 7 3-credit General Education Elective Courses
- Program Residency

Students must complete a minimum of 38 credits in this program at Fanshawe College to meet the Program Residency requirement and graduate from this program.



## Why Should You Hire a Co-op Student?

Many employers feel today's graduates have no concept of the "real" world of work; we are providing this experience in Co-operative Education. Any job that gives the student related background in your business would be suitable.

Co-operative Education students are ultimately looking ahead to careers in businesses such as yours. For this reason they are not expecting to simply put in time on the job, but are eager to get involved and make a worthwhile contribution. Participation in co-operative education also gives the employer the opportunity to try out a student's capabilities without obligation or commitment to permanent employment.

This work oriented educational system integrates classroom study and paid, on-the-job work experience, by alternating periods in College with periods of employment by co-operating organizations.

The work terms are spaced out through the academic program and students will be at various academic levels in successive work terms. The working experience will ideally increase in difficulty and responsibility as the student progresses academically. However, the College realizes it is often difficult in practice to do this.

It is essential that the work experience be a normal one; that the student be treated like a regular company employee so that a realistic picture of the working environment in that field may be obtained. Perhaps most important is what students gain from the working experience: an attitude for success and the ability to get along with co-workers at all levels.

