

# Biotechnology

Co-operative Education Option is available. See the Co-operative Education section of this Calendar for details.

## Graduation Requirements

In addition to the requirements listed below, students must satisfy:

1. the University regulations (see the *Academic Regulations of the University* section of this Calendar),
2. the Faculty regulations applying to all B.Sc. students including those relating to Science Continuation and Breadth requirements (see the *Academic Regulations for the Bachelor of Science* section of this Calendar).

Students should consult with the Department or Institute responsible for their program when planning their program and selecting courses.

## Program Requirements

### General Note on Programs

Students in the Biochemistry and Biotechnology program must complete BIOC 4907 [1.0] or BIOC 4908 [1.0].

Students in the Biology and Biotechnology program must complete BIOL 4907 [1.0] or BIOL 4908 [1.0]. BIOC 4908 [1.0] and BIOL 4908 [1.0] are subject to limited enrollment and requires that students secure a supervisor in the year prior to their Honours thesis.

### Biochemistry and Biotechnology

#### B.Sc. Honours (20.0 credits)

##### A. Credits Included in the Major CGPA (14.5 credits)

##### 1. 2.5 credits in: 2.5

BIOL 1103 [0.5] Foundations of Biology I

BIOL 1104 [0.5] Foundations of Biology II

BIOL 2104 [0.5] Introductory Genetics

BIOL 2303 [0.5] Microbiology

BIOL 3104 [0.5] Molecular Genetics

##### 2. 0.5 credit from: 0.5

BIOL 2001 [0.5] Animals: Form and Function

BIOL 2002 [0.5] Plants: Form and Function

##### 3. 0.5 credit from: 0.5

BIOL 3205 [0.5] Plant Biochemistry and Physiology

BIOL 3305 [0.5] Human and Comparative Physiology

BIOL 3306 [0.5] Human Anatomy and Physiology

##### 4. 1.0 credit from: 1.0

BIOL 3201 [0.5] Cell Biology

BIOL 3303 [0.5] Experimental Microbiology

BIOL 3307 [0.5] Advanced Human Anatomy and Physiology

BIOL 4106 [0.5] Advances in Molecular Biology

BIOL 4109 [0.5] Laboratory Techniques in Molecular Genetics

BIOL 4201 [0.5] Advanced Cell Culture and Tissue Engineering

BIOL 4300 [0.5] Applied and Environmental Microbiology

BIOL 4301 [0.5] Current Topics in Biotechnology

##### 5. 3.0 credits in: 3.0

BIOC 2200 [0.5] Cellular Biochemistry

BIOC 3006 [1.0] Practical Biochemistry

BIOC 3101 [0.5] General Biochemistry I

BIOC 3102 [0.5] General Biochemistry II

BIOC 3202 [0.5] Biophysical Techniques and Applications

##### 6. 1.0 credit from: 1.0

BIOC 4907 [1.0] Honours Essay and Research Proposal

BIOC 4908 [1.0] Research Project

##### 7. 1.0 credit from: 1.0

BIOC 4004 [0.5] Industrial Biochemistry

BIOC 4005 [0.5] Biochemical Regulation

BIOC 4007 [0.5] Membrane Biochemistry

BIOC 4009 [0.5] Biochemistry of Disease

BIOC 4200 [0.5] Immunology

BIOC 4201 [0.5] Advanced Cell Culture and Tissue Engineering

BIOC 4202 [0.5] Mutagenesis and DNA Repair

BIOC 4203 [0.5] Advanced Metabolism

BIOC 4204 [0.5] Protein Biotechnology

BIOC 4400 [0.5] Nuclear Dynamics and the Cell Cycle

##### 8. 4.0 credits in: 4.0

CHEM 1001 [0.5] General Chemistry I

CHEM 1002 [0.5] General Chemistry II

CHEM 2103 [0.5] Physical Chemistry I

or BIOC 2300 [0.5] Physical Biochemistry

CHEM 2203 [0.5] Organic Chemistry I

CHEM 2204 [0.5] Organic Chemistry II

CHEM 2303 [0.5] Analytical Chemistry II

CHEM 2501 [0.5] Introduction to Inorganic and Bioinorganic Chemistry

CHEM 3201 [0.5] Advanced Organic Chemistry I

##### 9. 0.5 credit from: 0.5

CHEM 3202 [0.5] Advanced Organic Chemistry II

CHEM 3205 [0.5] Experimental Organic Chemistry

##### 10. 0.5 credit in BIOC chosen from Item 7 above, or: 0.5

BIOC 2400 [0.5] Independent Research I

BIOC 3400 [0.5] Independent Research II

BIOC 3008 [0.5] Bioinformatics

BIOC 4001 [0.5] Methods in Biochemistry

BIOC 4008 [0.5] Computational Systems Biology

BIOC 4708 [0.5] Principles of Toxicology

BIOC 4901 [0.5] Selected Topics in Biochemistry

BIOL 2001 [0.5] Animals: Form and Function

BIOL 2002 [0.5] Plants: Form and Function

BIOL 3102 [0.5] Mycology

BIOL 3201 [0.5] Cell Biology

BIOL 3202 [0.5] Principles of Developmental Biology

BIOL 3205 [0.5] Plant Biochemistry and Physiology

BIOL 3303 [0.5] Experimental Microbiology

BIOL 3305 [0.5]	Human and Comparative Physiology	
BIOL 4106 [0.5]	Advances in Molecular Biology	
BIOL 4109 [0.5]	Laboratory Techniques in Molecular Genetics	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	
BIOL 4209 [0.5]	Advanced Plant Physiology	
BIOL 4300 [0.5]	Applied and Environmental Microbiology	
BIOL 4301 [0.5]	Current Topics in Biotechnology	
CHEM 3100 [0.5]	Physical Chemistry II	
CHEM 3202 [0.5]	Advanced Organic Chemistry II	
CHEM 3205 [0.5]	Experimental Organic Chemistry	
CHEM 3700 [0.5]	Industrial Applications of Chemistry	
CHEM 3800 [0.5]	The Chemistry of Environmental Pollutants	
CHEM 4406 [0.5]	Pharmaceutical Drug Design	
<b>B. Credits Not Included in the Major CGPA (5.5 credits)</b>		
<b>11. 1.0 credit from:</b>		1.0
PHYS 1007 [0.5] & PHYS 1008 [0.5]	Elementary University Physics I and Elementary University Physics II	
PHYS 1003 [0.5] & PHYS 1004 [0.5]	Introductory Mechanics and Thermodynamics and Introductory Electromagnetism and Wave Motion	
<b>12. 1.5 credits in:</b>		1.5
MATH 1007 [0.5]	Elementary Calculus I	
MATH 1107 [0.5]	Linear Algebra I	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
<b>13. 0.5 credit in:</b>		0.5
NSCI 1000 [0.5]	Seminar in Science (or an Approved Arts or Social Sciences elective)	
<b>14. 1.5 credits in Approved Arts or Social Sciences electives</b>		1.5
<b>15. 1.0 credit in free elective.</b>		1.0
Total Credits		20.0

## Biology and Biotechnology

### B.Sc. Honours (20.0 credits)

#### A. Credits Included in the Major CGPA (12.5 credits)

<b>1. 5.0 credits in:</b>		5.0
BIOL 1103 [0.5]	Foundations of Biology I	
BIOL 1104 [0.5]	Foundations of Biology II	
BIOL 2001 [0.5]	Animals: Form and Function	
BIOL 2002 [0.5]	Plants: Form and Function	
BIOL 2104 [0.5]	Introductory Genetics	
BIOL 2200 [0.5]	Cellular Biochemistry	
BIOL 2303 [0.5]	Microbiology	
BIOL 3104 [0.5]	Molecular Genetics	
BIOL 3201 [0.5]	Cell Biology	
BIOL 4301 [0.5]	Current Topics in Biotechnology	
<b>2. 0.5 credit from:</b>		0.5
BIOL 3205 [0.5]	Plant Biochemistry and Physiology	
BIOL 3305 [0.5]	Human and Comparative Physiology	

<b>3. 1.5 credits in:</b>		1.5
BIOC 3101 [0.5]	General Biochemistry I	
BIOC 3102 [0.5]	General Biochemistry II	
BIOC 4004 [0.5]	Industrial Biochemistry	

<b>4. 1.0 credit from:</b>		1.0
BIOL 4106 [0.5]	Advances in Molecular Biology	
BIOL 4109 [0.5]	Laboratory Techniques in Molecular Genetics	
BIOL 4200 [0.5]	Immunology	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	

<b>5. 3.5 credits from:</b>		3.5
BIOL 3102 [0.5]	Mycology	
BIOC 3202 [0.5]	Biophysical Techniques and Applications	
BIOL 3303 [0.5]	Experimental Microbiology	
BIOL 3901 [0.5]	Research Proposal	
BIOL 4106 [0.5]	Advances in Molecular Biology	
BIOL 4109 [0.5]	Laboratory Techniques in Molecular Genetics	

BIOL 4200 [0.5]	Immunology	
BIOL 4201 [0.5]	Advanced Cell Culture and Tissue Engineering	
BIOL 4202 [0.5]	Mutagenesis and DNA Repair	
BIOC 2300 [0.5] or CHEM 2103 [0.5]	Physical Biochemistry or Physical Chemistry I	
BIOL 4901 [0.5]	Directed Special Studies	
BIOC 3006 [1.0]	Practical Biochemistry	
BIOC 3008 [0.5]	Bioinformatics	
BIOC 4001 [0.5]	Methods in Biochemistry	
BIOC 4005 [0.5]	Biochemical Regulation	
BIOC 4007 [0.5]	Membrane Biochemistry	
BIOC 4008 [0.5]	Computational Systems Biology	
BIOC 4009 [0.5]	Biochemistry of Disease	
BIOC 4204 [0.5]	Protein Biotechnology	
BIOC 4708 [0.5]	Principles of Toxicology	
CHEM 3700 [0.5]	Industrial Applications of Chemistry	
CHEM 3800 [0.5]	The Chemistry of Environmental Pollutants	
TSES 4001 [0.5]	Technology and Society: Risk	
TSES 4002 [0.5]	Technology and Society: Forecasting	

<b>6. 1.0 credit in:</b>		1.0
BIOL 4907 [1.0]	Honours Essay and Research Proposal	
or BIOL 4908 [1.0]	Honours Research Thesis	

#### B. Credits Not Included in the Major CGPA (7.5 credits)

<b>7. 2.0 credits in:</b>		2.0
CHEM 1001 [0.5] & CHEM 1002 [0.5]	General Chemistry I and General Chemistry II	
CHEM 2203 [0.5] & CHEM 2204 [0.5]	Organic Chemistry I and Organic Chemistry II (See Note, below)	

<b>8. 1.0 credit from:</b>		1.0
PHYS 1007 [0.5] & PHYS 1008 [0.5]	Elementary University Physics I and Elementary University Physics II	

PHYS 1003 [0.5] & PHYS 1004 [0.5]	Introductory Mechanics and Thermodynamics and Introductory Electromagnetism and Wave Motion	
<b>9. 1.5 credits in:</b>		<b>1.5</b>
MATH 1007 [0.5]	Elementary Calculus I	
MATH 1107 [0.5]	Linear Algebra I	
STAT 2507 [0.5]	Introduction to Statistical Modeling I	
<b>10. 0.5 credit in:</b>		<b>0.5</b>
NSCI 1000 [0.5]	Seminar in Science (or Approved Arts or Social Sciences)	
<b>11. 1.5 credits in</b>	Approved Arts or Social Sciences	<b>1.5</b>
<b>12. 1.0 credit free elective.</b>		<b>1.0</b>
<b>Total Credits</b>		<b>20.0</b>

**Note:** For **Item 7** above, CHEM 1001 General Chemistry I and CHEM 1002 General Chemistry II are strongly recommended for this program. Students may substitute CHEM 1001 General Chemistry I and CHEM 1002 General Chemistry II with CHEM 1005 Elementary Chemistry I and CHEM 1006 Elementary Chemistry II, respectively. Students choosing CHEM 1005 Elementary Chemistry I and CHEM 1006 Elementary Chemistry II will be required to obtain a grade of B- or higher in CHEM 1006 Elementary Chemistry II to take BIOL 2200 Cellular Biochemistry and more advanced courses in BIOC and CHEM. Students completing CHEM 1005 Elementary Chemistry I with a grade of B- or higher are encouraged to register for CHEM 1002 General Chemistry II.