

# BIOLOGY (BIOL)

Updated Feb. 4, 2017

**Chair: Professor Judith D. Huebner;** Professors Emeriti: W.S. Evans, G.E.E. Moodie, R.J. Staniforth, R.A. Woods; Professors: A. Civetta, L.S. Forbes, J. Tardif, A.R. Westwood, M.D. Wiegand; Associate Professors: R. Anderson, G. Avila- Sakar, R. Douville, J. Franck, S. Good, P.W. Holloway, S. Lingle, A. Park, A. Shrivastav, C. Willis; Assistant Professors: R. Otfinowski; Instructors: B. Biernacka, C. DuGuay, A. McGreevy, K. Muc, L. Warszycki; Lab Manager: N. Taiarol; Technical Staff: L.G. Buchanan, R. Cole, K. Kachur, D. Nickel, M. Rondeau, M. Torres, D. Wasyliw.

## DEGREES/PROGRAMS OFFERED

**3-Year BSc**

**3-Year BSc (Business Stream)**

**4-Year BSc**

**4-Year BSc (Business Stream)**

**Honours BSc**

**4-Year BSc (UW/RRC)**

**MSc in Bioscience, Technology & Public Policy (For more information, please see the *Graduate Studies Academic Calendar*.)**

## INTRODUCTION

The study of Biology encompasses any manifestation of life, from the DNA molecule to the interactions of organisms within the various ecosystems of the earth. This broad discipline includes the subject areas of Botany, Zoology, Microbiology, Ecology, Genetics and Molecular Biology.

The Biology Department offers the 3-Year BSc, 4-Year BSc, and BSc Honours degrees. Two additional degree options available are the University of Winnipeg/Red River College 4-Year BSc in Applied Biology, and a Co-operative Program that combines a 3-Year BSc Degree in Biology with a diploma in Chemical and Biosciences Technology.

Students pursuing a 3-year or 4-year BSc in Biology have the opportunity to take a Business Stream – a set of core courses in the Faculty of Business that will provide them with the skills needed to enter and succeed in industry and business. See the "Science with a Business Stream" section of this Course Calendar.

In addition, courses in Biology constitute the core of the Environmental Studies Forest Ecology Program, the Forest Policy and Management Program, the Biochemistry Program, the Biopsychology Program and the Bioanthropology Program.

A BSc in Biology can lead to employment in Conservation or other government departments, work as a technologist in a research or industrial laboratory, as well as a career in education. It also provides the preparation necessary for those entering several professional programs including Dentistry, Medicine, Veterinary Medicine, Pharmacy and Optometry.

Many Biology graduates also pursue post-graduate education. The necessary academic preparation for post-graduate studies is **only** provided by the 4-Year and Honours degrees in Biology. The 3-Year BSc and the Applied Biology degrees are not recognized as adequate preparation by most Graduate Studies Programs in Canada or internationally.

## REQUIREMENTS FOR A 3-YEAR BSc IN BIOLOGY

**ADMISSION REQUIREMENT** Students should consult with a member of the Department in planning their course of study.

**GRADUATION REQUIREMENT** 90 credit hours

### RESIDENCE REQUIREMENT

Degree: Minimum 30 credit hours

Major: Minimum 18 credit hours

### GENERAL DEGREE REQUIREMENT

Humanities: 12 credit hours in Humanities

Writing: Minimum 3 credit hours of Academic Writing.

Indigenous: 3 credit hours in designated Indigenous requirement courses

Maximum Introductory Courses: Students may use a maximum of 42 credit hours at the 1000 level. Of these, a maximum of 6 credit hours may be below the 1000 level.

Distribution: Minimum three (3) credit hours from each of five (5) different subjects.

### MAJOR REQUIREMENT

Single Major: Minimum 30 credit hours/Maximum 48 credit hours in the Major subject.

Double Major: 30 credit hours in Biology and specified number of credit hours in the other department/program.

Required courses:

#### 1. Mandatory courses

- **BIOL-1115(3)** Cells and Cellular Processes, and **BIOL-1116(3)** Evolution, Ecology and Biodiversity.

- Minimum 24 credit hours in other Biology courses at or above the 2000 level, not including **BIOL-4111(6)** Biology Honours Thesis.

2. Statistics Requirement - 3 credit hours of statistics chosen from the following courses:

STAT-1301(3) Statistical Analysis I  
STAT-1501(3) Elementary Biological Statistics I  
GEOG-2309(3) Statistical Techniques in Environmental Analysis  
PSYC-2101(3) Introduction to Data Analysis  
The former STAT-1201(6) Introduction to Statistical Analysis

3. At least 15 **additional** credit hours of ancillary science (non-Biology) courses at or above the 1000 level selected from the following departments/courses, for a total of at least 18 credit hours of non-Biology science. At least **one other** department must be represented, in addition to that chosen from the above statistics options list.

**ANTHROPOLOGY – ONLY:**

ANTH-2300(3) Methods and Theory in Biological Anthropology  
ANTH-2304(3) Introduction to Forensic Anthropology  
ANTH-3207(3) Zooarchaeology  
ANTH-3302/4302(3) Primate Adaptation, Biology, and Evolution  
ANTH-3306(3) Human Osteology  
ANTH-3308/4308(3) Human Evolution  
ANTH-3309/4309(3) Primate Behaviour  
ANTH-4212(3) Advanced Zooarchaeology  
ANTH-4303(3) Problems in Human and Primate Evolution  
ANTH-4305(3) Problems in Biological Anthropology  
ANTH-4307(3) Advanced Human Osteology  
ANTH-4311(3) Human Paleopathology

**CHEMISTRY – ALL courses EXCEPT:**

CHEM-2801(3) Environmental Issues: A Chemistry Perspective (formerly Chemistry and Society)

**GEOGRAPHY – ONLY:**

Physical Geography courses (second digit in the course number is "2")  
Geomatics courses (second digit in the course number is "3")

**KINESIOLOGY – ONLY:**

KIN-2204(3) Introduction to Human Physiology  
KIN-2301(3) Human Anatomy  
KIN-3106 (3) Exercise Physiology  
KIN-3201(3) Biomechanics

**MATHEMATICS – ALL courses EXCEPT:**

MATH-2305(3) Philosophy and Mathematics

**PHYSICS – ALL courses EXCEPT:**

PHYS-1005(6) Concepts in Science  
PHYS-1701(6) Astronomy  
PHYS-2705(6) Cosmology: Science Fact to Science Fiction

**PSYCHOLOGY – ONLY:**

PSYC-2101(3) Introduction to Data Analysis  
PSYC-2900(3) Physiological Psychology I  
PSYC-3900(3) Physiological Psychology II

**STATISTICS – All courses**

Combined Major: Minimum 48 credit hours from two (2) different majors with not less than 18 credit hours from each major subject.

Prescribed courses:

**BIOL-1115(3)** Cells and Cellular Processes  
**BIOL-1116(3)** Evolution, Ecology and Biodiversity

Restrictions: Only 6 credit hours at the 1000 level will be credited towards the combined major. Any other 1000-level course would be considered as an elective.

## REQUIREMENTS FOR THE 3-YEAR BSc IN BIOLOGY WITH A BUSINESS STREAM

Students must complete the requirements of the 3-year BSc in Biology degree (see previous section) and the set of core courses indicated in the "Science with a Business Stream" section of the Calendar.

# REQUIREMENTS FOR A 4-YEAR BSc IN BIOLOGY

<b>ADMISSION REQUIREMENT</b>	Students must consult with the Department Advisor in planning their studies.
<b>GRADUATION REQUIREMENT</b>	120 credit hours, that is, 90 credit hours meeting the requirements for the 3-Year BSc plus an additional 30 credit hours.
<b>RESIDENCE REQUIREMENT</b>	
Degree:	Minimum 60 credit hours
Major:	Minimum 30 credit hours

## GENERAL DEGREE REQUIREMENT

Humanities:	12 credit hours
Writing:	Minimum 3 credit hours of Academic Writing.
Indigenous:	3 credit hours in designated Indigenous requirement courses
Maximum Introductory Courses:	Students may use a maximum of 42 credit hours at the 1000 level. Of these, a maximum of 6 credit hours may be below the 1000 level.
Distribution:	Minimum three (3) credit hours from each of five (5) different subjects.

## MAJOR REQUIREMENT

Single Major:	Minimum 48 credit hours/Maximum 78 credit hours in the Major subject.
Double Major:	Minimum 48 credit hours in Biology and specified number of courses in other Major.

Required courses:

### 1. Mandatory Courses

- BIOL-1115(3)** Cells and Cellular Processes
- BIOL-1116(3)** Evolution, Ecology and Biodiversity
- BIOL-2301(3)** Genetics
- BIOL-2403(3)** Principles of Ecology or **BIOL-3902(3)** Microbial Ecology)
- BIOL-3221(3)** Cell Biology

In addition to the above prescribed courses, students must complete an additional minimum of 33 credit hours in Biology at or above the 2000 level.

Students taking the 4-Year BSc in preparation for graduate studies are strongly advised to enrol in the BSc Honours program (see below).

### 2. Statistics Requirement - 6 credit hours of statistics chosen from the following course pairings:

- **STAT-1301(3)** Statistical Analysis I and **STAT-1302(3)** Statistical Analysis II or the former **STAT-1201(6)** Introduction to Statistical Analysis
- OR**
- **STAT-1501(3)** Elementary Biological Statistics I **AND ONE OF STAT-2001(3)** Elementary Biological Statistics II or **BIOL-3492(3)** Quantitative & Theoretical Biology or **BIOL-4471(3)** Ecological Methods or the former **STAT-1601(3)** Elementary Biological Statistics II
- OR**
- **GEOG-2309(3)** Statistical Techniques in Environmental Analysis **AND ONE OF BIOL-3492(3)** Quantitative & Theoretical Biology or **BIOL-4471(3)** Ecological Methods
- OR**
- **PSYC-2101(3)** Introduction to Data Analysis **AND ONE OF PSYC-2102(3)** Introduction to Research Methods or **BIOL-3492(3)** Quantitative & Theoretical Biology or **BIOL-4471(3)** Ecological Methods

**3.** At least 18 additional credit hours of ancillary science (non-Biology) courses at or above the 1000 level selected from the following departments/courses, for a total of at least 24 credit hours of non-Biology science (or 21 credit hours if a Biology course is selected as part of the statistics requirement). At least **one other** department must be represented in addition to that chosen from the above statistics options list.

#### ANTHROPOLOGY – **ONLY**:

- ANTH-2300(3) Methods and Theory in Biological Anthropology
- ANTH-2304(3) Introduction to Forensic Anthropology
- ANTH-3207(3) Zooarchaeology
- ANTH-3302/4302(3) Primate Adaptation, Biology, and Evolution
- ANTH-3306(3) Human Osteology
- ANTH-3308/4308(3) Human Evolution
- ANTH-3309/4309(3) Primate Behaviour
- ANTH-4212(3) Advanced Zooarchaeology
- ANTH-4303(3) Problems in Human and Primate Evolution
- ANTH-4305(3) Problems in Biological Anthropology
- ANTH-4307(3) Advanced Human Osteology
- ANTH-4311(3) Human Paleopathology

#### CHEMISTRY – ALL courses **EXCEPT**:

- CHEM-2801(3) Environmental Issues: A Chemistry Perspective (formerly Chemistry and Society)

**GEOGRAPHY – ONLY:**

Physical Geography courses (second digit in the course number is "2")  
Geomatics courses (second digit in the course number is "3")

**KINESIOLOGY – ONLY:**

KIN-2204(3) Introduction to Human Physiology  
KIN-2301(3) Human Anatomy  
KIN-3106 (3) Exercise Physiology  
KIN-3201(3) Biomechanics

**MATHEMATICS – ALL courses EXCEPT:**

MATH-2305(3) Philosophy and Mathematics

**PHYSICS – ALL courses EXCEPT:**

PHYS-1005(6) Concepts in Science  
PHYS-1701(6) Astronomy  
PHYS-2705(6) Cosmology: Science Fact to Science Fiction

**PSYCHOLOGY – ONLY:**

PSYC-2101(3) Introduction to Data Analysis  
PSYC-2900(3) Physiological Psychology I  
PSYC-3900(3) Physiological Psychology II

**STATISTICS – All courses**

Combined Major: Minimum 60 credit hours from two (2) different majors with not less than 24 credit hours from each major subject.

Prescribed courses:

**BIOL-1115(3)** Cells and Cellular Processes  
**BIOL-1116(3)** Evolution, Ecology and Biodiversity

Restrictions: Only 6 credit hours at the 1000 level will be credited towards the combined major. Any other 1000-level course would be considered as an elective.

## REQUIREMENTS FOR THE 4-YEAR BSc IN BIOLOGY WITH A BUSINESS STREAM

Students must complete the requirements of the 4-year BSc in Biology degree (see previous section) and the set of core courses indicated in the "Science with a Business Stream" section of the Calendar.

## REQUIREMENTS FOR AN HONOURS BSc IN BIOLOGY

<b>ADMISSION REQUIREMENT</b>	Students must consult with the Department Advisor in planning their studies.
<b>GRADUATION REQUIREMENT</b>	120 credit hours
Graduation G.P.A. Requirement	To graduate with a BSc Honours, students must have a minimum GPA of 3.0 on all major (Biology) courses which will be calculated on all course attempts in the major. A minimum 2.75 GPA on all non-major courses which will be calculated as for the General Degree (i.e., F's are not included and, in the case of repeated courses, only the highest grade will be used).
<b>RESIDENCE REQUIREMENT</b>	
Degree:	Minimum 60 credit hours
Honours:	Minimum 30 credit hours, including minimum 18 credit hours at upper level (3000/4000) of which a minimum of 9 credit hours at 4000 level
<b>GENERAL DEGREE REQUIREMENT</b>	
Humanities:	12 credit hours in Humanities
Writing:	Minimum 3 credit hours of Academic Writing.
Indigenous:	3 credit hours in designated Indigenous requirement courses
Maximum Introductory Courses:	Students may use a maximum of 42 credit hours at the 1000 level. Of these, a maximum of 6 credit hours may be below the 1000 level.
Distribution:	Minimum three (3) credit hours from each of five (5) different subjects.
<b>HONOURS REQUIREMENT</b>	
Single Honours:	Minimum 54 credit hours in the Major subject.

Minimum 30 credit hours in upper-level (3000 and 4000) courses of which a minimum of 15 credit hours must be at the 4000 level.

Required Courses:

1. Mandatory courses:
  - **BIOL-1115(3)** Cells and Cellular Processes
  - **BIOL-1116(3)** Evolution, Ecology and Biodiversity
  - **BIOL-2301(3)** Genetics
  - **BIOL-2403(3)** Principles of Ecology or **BIOL-3902(3)** Microbial Ecology
  - **BIOL-3221(3)** Cell Biology
  - **BIOL-4111(6)** Biology Honours Thesis **Note:** This course has admission restrictions, see course description.
  - **CHEM-1111(3)** Introduction to Chemical Properties of Matter
  - **CHEM-1112(3)** Basic Principles of Chemical Reactivity
  
2. In addition to the above courses students must select a minimum of 33 credit hours from the Biology course offerings at or above the 2000 level **including**:
  - 9 credit hours selected from:
    - BIOL-2115(3)** Biology of the Invertebrates **OR** **BIOL-2116(3)** Biology of the Vertebrates **OR** the former **BIOL-2111(6)** Comparative Chordate Zoology
    - BIOL-2152(3)** Biology of Algae, Fungi, and Mosses
    - BIOL-2153(3)** Biology of Vascular Plants
    - BIOL-2902(3)** Biology of Bacteria and Archaea
  - 9 credit hours selected from the 4000-level courses in addition to **BIOL-4111(6)** Biology Honours Thesis.
  
3. Statistics Requirement - 6 credit hours of statistics chosen from the following course pairings:
  - **STAT-1301(3)** Statistical Analysis I and **STAT-1302(3)** Statistical Analysis II or the former **STAT-1201(6)** Introduction to Statistical Analysis

**OR**

  - **STAT-1501(3)** Elementary Biological Statistics I **AND ONE OF** **STAT-2001(3)** Elementary Biological Statistics II or **BIOL-3492(3)** Quantitative & Theoretical Biology or **BIOL-4471(3)** Ecological Methods or the former **STAT-1601(3)** Elementary Biological Statistics II

**OR**

  - **GEOG-2309(3)** Statistical Techniques in Environmental Analysis **AND ONE OF** **BIOL-3492(3)** Quantitative & Theoretical Biology or **BIOL-4471(3)** Ecological Methods

**OR**

  - **PSYC-2101(3)** Introduction to Data Analysis **AND ONE OF** **PSYC-2102(3)** Introduction to Research Methods or **BIOL-3492(3)** Quantitative & Theoretical Biology or **BIOL-4471(3)** Ecological Methods
  
4. At least 12 credit hours of ancillary science (non-Biology) courses at or above the 1000 level selected from the following departments/courses. At least **one other** department must be represented in addition to that chosen from the above statistics options list.

ANTHROPOLOGY – **ONLY**:

- ANTH-2300(3)** Methods and Theory in Biological Anthropology
- ANTH-2304(3)** Introduction to Forensic Anthropology
- ANTH-3207(3)** Zooarchaeology
- ANTH-3302/4302(3)** Primate Adaptation, Biology, and Evolution
- ANTH-3306(3)** Human Osteology
- ANTH-3308/4308(3)** Human Evolution
- ANTH-3309/4309(3)** Primate Behaviour
- ANTH-4212(3)** Advanced Zooarchaeology
- ANTH-4303(3)** Problems in Human and Primate Evolution
- ANTH-4305(3)** Problems in Biological Anthropology
- ANTH-4307(3)** Advanced Human Osteology
- ANTH-4311(3)** Human Paleopathology

CHEMISTRY – ALL courses **EXCEPT**:

- CHEM-2801(3)** Environmental Issues: A Chemistry Perspective (formerly Chemistry and Society)

GEOGRAPHY – **ONLY**:

- Physical Geography courses (second digit in the course number is "2")
- Geomatics courses (second digit in the course number is "3")

KINESIOLOGY – **ONLY**:

- KIN-2204(3)** Introduction to Human Physiology
- KIN-2301(3)** Human Anatomy
- KIN-3106(3)** Exercise Physiology
- KIN-3201(3)** Biomechanics

MATHEMATICS – ALL courses **EXCEPT**:

- MATH-2305(3)** Philosophy and Mathematics

PHYSICS – ALL courses **EXCEPT:**

**PHYS-1005(6)** Concepts in Science

**PHYS-1701(6)** Astronomy

**PHYS-2705(6)** Cosmology: Science Fact to Science Fiction

PSYCHOLOGY – **ONLY:**

**PSYC-2101(3)** Introduction to Data Analysis

**PSYC-2900(3)** Physiological Psychology I

**PSYC-3900(3)** Physiological Psychology II

STATISTICS – All courses

## REQUIREMENTS FOR THE UNIVERSITY OF WINNIPEG / RED RIVER COLLEGE 4-YEAR BSc (JOINT PROGRAM IN APPLIED BIOLOGY)

### INTRODUCTION

This is a joint degree program whereby students take courses at both institutions in a prescribed sequence. The program has been specifically designed to address the human resource needs of the health and environmental-based industries of Manitoba. Biotechnology is the area of emphasis in the Applied Biology program and the degree requirements are outlined below.

Students are required to complete courses at both institutions. Students will begin their program of study by completing 60 credit hours of course work at The University of Winnipeg. The next 30 credit hours are completed at Red River College and then students return to The University of Winnipeg to complete the final 30 credit hours. Students successfully completing the entire program will receive a joint degree parchment from The University of Winnipeg and Red River College. **N.B. Transfer of courses between institutions applies only to students who are officially in the joint program.**

### ADMISSION REQUIREMENT

Students must meet the entrance requirements for admission to The University of Winnipeg.

Application to the program in Applied Biology must be completed through the Admissions Office of The University of Winnipeg by March 1<sup>st</sup> in order to enter the program in September.

### GRADUATION REQUIREMENT

120 credit hours, that is, 90 credit hours meeting the requirements for the BSc General plus 30 additional credit hours.

### RESIDENCE REQUIREMENT

Degree:

Minimum 60 credit hours

Major:

Minimum 30 credit hours

### GENERAL DEGREE REQUIREMENT

Humanities:

12 credit hours in Humanities

Writing:

Minimum 3 credit hours of Academic Writing.

Indigenous:

3 credit hours in designated Indigenous requirement courses

Maximum Introductory Courses:

Students may use a maximum of 42 credit hours at the 1000 level. Of these, a maximum of 6 credit hours may be below the 1000 level.

Distribution:

Minimum three (3) credit hours from each of five (5) different subjects.

4-Year Joint Program in Applied Biology	
Year 1 – UW	Year 2 - UW
BIOL-1115(3) Cells and Cellular Processes BIOL-1116(3) Evolution, Ecology and Biodiversity CHEM-1111(3) Intro to the Chemical Properties of Matter CHEM-1112(3) Basic Principles of Chemical Reactivity ACS-1453(3) Intro to Computers <b>OR</b> ACS-1903(3) Programming Fundamentals 1 STAT-1501(3) Elementary Biological Statistics I RHET-1103(3) Academic Writing: Sciences 3 credit hours Humanities 3 credit hours Indigenous Course 3 credit hours of electives	CHEM-2302(3) Quantitative Chemical Analysis CHEM-3302(3) Methods of Chemical Analysis CHEM-2202(3) Organic Chemistry I CHEM-2203(3) Organic Chemistry II BIOL-2301(3) Genetics BIOL-2902(3) Biology of Bacteria and Archaea (formerly "Biology of the Prokaryotes and Viruses") BIOL-3901(3) Microorganisms & Disease BIOL-3221(3) Cell biology - to be completed in Winter Term 3 credit hours Humanities 3 credit hours of electives

Year 3 – RRC	Year 4 - UW
BIOL-1003(5) Basic & Applied Microbiology CBST-1026(3) Gas Chromatography CBST-3001(6) Advanced Biochemistry CHEM-1028(3) High Performance Liquid Chromatography CBST-1021(3) Molecular Biology CBST-1028(2) Immunology CBST-1031(3) Introductory Biochemistry CBST-1043(2) Tissue Culture CHEM-1041(3) Spectroscopy CHEM-2033(3) Nutraceuticals	BIOL-2403(3) Principles of Ecology BIOL-4502(3) Molecular Cell Biology BIOL-4501(3) Developmental Biology CHEM-4502(3) Molecular Enzymology 6 credit hours chosen from: BIOL-3602(3) Comparative Animal Physiology I, BIOL-3603(3) Comparative Animal Physiology II, BIOL-3163(3) Seed Plant Anatomy & Physiology The former BIOL-3161(3) Vegetative Anatomy & Physiology of Seed Plants The former BIOL-3162(3) Reproductive Anatomy & Physiology of Seed Plants BIOL-4902(3) Microbial Physiology <b>NB: These courses have prerequisites that may not be included in the program. Consult a faculty advisor each year in planning your full program of study.</b> 6 credit hours of Humanities 6 credit hours of Electives

## REQUIREMENTS FOR THE 3-YEAR BSc DEGREE OF THE UW/RRC COOPERATIVE AGREEMENT IN CHEMICAL AND BIOSCIENCES TECHNOLOGY

In addition to the above program, The University of Winnipeg and Red River College (RRC) have a cooperative agreement for a program of studies designed to afford students the opportunity to obtain both the BSc General degree and the Diploma in Chemical and Biosciences Technology in four years, by allowing credit for work completed at the alternate institution.

**ADMISSION REQUIREMENT** Students must consult with a member of the Department in planning their course of study.

**GRADUATION REQUIREMENT** Minimum 60 credit hours

**RESIDENCE REQUIREMENT**  
Degree: Minimum 60 credit hours

**GENERAL DEGREE REQUIREMENT**  
Humanities: 12 credit hours in Humanities  
Indigenous: 3 credit hours in designated Indigenous requirement courses

Required courses:

**21** credit hours in Biology at the 2000 level or above, excluding **BIOL-4111(6)** Biology Honours Thesis.

Minimum 18 credit hours of ancillary science (non-Biology) courses at or above the 1000 level selected from at least 2 Departments. See 3 year Biology Major for both courses which may be included in meeting this requirement, and courses which are excluded .

## COURSE LISTINGS

### 1000 LEVEL COURSES

**Note 1:** Students must obtain credit in both **BIOL-1115(3)** and **BIOL-1116(3)** to satisfy the requirements for a major in Biology.

**Note 2:** Students can elect to take up to 6 additional credit hours in Biology at the 1000 level; however, these additional credit hours will not count towards the requirement for a major in Biology.

**Note 3:** Students who wish to use **BIOL-1112(6)** (Human Anatomy and Physiology) as a prerequisite for advanced courses in Biology must obtain the permission of the Department Chair.

BIOL-1005(6) Concepts in Science  
 BIOL-1102(6) Biology and Human Concerns  
 BIOL-1103(6) Human Biology  
 BIOL-1106(3) Environmental Biology  
 BIOL-1112(6) Human Anatomy and Physiology  
 BIOL-1115(3) Cells and Cellular Processes  
 BIOL-1116(3) Evolution, Ecology and Biodiversity

### 2000 LEVEL COURSES

BIOL-2115(3) Biology of the Invertebrates  
 BIOL-2116(3) Biology of the Vertebrates  
 BIOL-2152(3) Introduction to Algae, Fungi and Mosses  
 BIOL-2153(3) Biology of Vascular Plants  
 BIOL-2301(3) Genetics  
 BIOL-2401(1) Forest Ecology Field Skills Course  
 BIOL-2403(3) Principles of Ecology  
 BIOL-2451(3) Introduction to Animal Behaviour  
 BIOL-2477(3) Forest Measurement  
 BIOL-2902(3) Biology of Bacteria and Archaea (formerly "Biology of the Prokaryotes and Viruses")

### 3000 LEVEL COURSES

**Note:** 3000-level courses may not be offered every year. Consult the current timetable for details.

BIOL-3112(3) Ecology and Evolution of Mammals  
BIOL-3152(3) Flora of Manitoba  
BIOL-3163(3) Seed Plant Anatomy & Physiology  
BIOL-3202(3) Histology  
BIOL-3221(3) Cell Biology  
BIOL-3303(3) Molecular Genetics and Genomics  
BIOL-3410(3) Freshwater Ecology  
BIOL-3452(3) Behavioural Ecology and the Prairie  
Grasslands: Field Course  
BIOL-3471(3) Forest Ecology  
BIOL-3473(3) Principles of Silviculture  
BIOL-3476(3) Forest Policy and Management  
BIOL-3492(3) Quantitative and Theoretical Biology  
BIOL-3562(3) Human Reproductive Biology  
BIOL-3563(3) Human Embryology  
BIOL-3602(3) Comparative Animal Physiology I  
BIOL-3603(3) Comparative Animal Physiology II  
BIOL-3702(3) Parasites and Disease  
BIOL-3703(3) Ectoparasitology  
BIOL-3801(3) General Entomology  
BIOL-3901(3) Microorganisms and Disease  
BIOL-3902(3) Microbial Ecology

### THE FOLLOWING COURSES ARE NOT OFFERED EVERY YEAR:

BIOL-2401(1) Forest Ecology Field Skills Course  
BIOL-2477(3) Forest Measurement  
BIOL-3112(3) Ecology and Evolution of Mammals  
BIOL-3152(3) Flora of Manitoba  
BIOL-3163(3) Seed Plant Anatomy & Physiology  
BIOL-3410(3) Freshwater Ecology  
BIOL-3452(3) Behavioural Ecology and the Prairie  
Grasslands: Field Course  
BIOL-3471(3) Forest Ecology  
BIOL-3473(3) Principles of Silviculture  
BIOL-3492(3) Quantitative and Theoretical Biology  
BIOL-3801(3) General Entomology  
BIOL-3902(3) Microbial Ecology

### 4000 LEVEL COURSES

**Note:** 4000-level courses may not be offered every year. Consult the current timetable for details.

BIOL-4111(6) Biology Honours Thesis  
BIOL-4112(3) Ichthyology  
BIOL-4191(3) Directed Studies in Biology  
BIOL-4303(3) Population Genetics  
BIOL-4331(3) Evolutionary Biology  
BIOL-4402(3) Current Topics in Ecology  
BIOL-4411(3) Water Quality and Health  
BIOL-4451(2) Forest Ecosystems Field Course  
BIOL-4453(3) Wetlands Ecosystems Field Course  
BIOL-4471(3) Ecological Methodology  
BIOL-4473(3) Dendrochronology: Principles and Applications  
BIOL-4474(3) Forest Health and Protection  
BIOL-4475(3) Urban Forestry  
BIOL-4501(3) Developmental Biology  
BIOL-4502(3) Molecular Cell Biology  
BIOL-4601(3) Ecological Animal Physiology  
BIOL-4602(3) Field Research in Animal Ecology and Energetics  
BIOL-4902(3) Microbial Physiology  
BIOL-4904(3) Virology  
BIOL-4905(3) Microbial Biotechnology  
BIOL-4931(3) Immunology  
BIOL-4950(3) Neurobiology

BIOL-4112(3) Ichthyology  
BIOL-4303(3) Population Genetics  
BIOL-4331(3) Evolutionary Biology  
BIOL-4402(3) Current Topics in Ecology  
BIOL-4411(3) Water Quality and Health  
BIOL-4451(2) Forest Ecosystems Field Course  
BIOL-4453(3) Wetlands Ecosystems Field Course  
BIOL-4471(3) Ecological Methodology  
BIOL-4473(3) Dendrochronology: Principles and Applications  
BIOL-4474(3) Forest Health and Protection  
BIOL-4475(3) Urban Forestry  
BIOL-4601(3) Ecological Animal Physiology  
BIOL-4602(3) Field Research in Animal Ecology and Energetics  
BIOL-4902(3) Microbial Physiology  
BIOL-4904(3) Virology  
BIOL-4905(3) Microbial Biotechnology  
BIOL-4931(3) Immunology  
BIOL-4950(3) Neurobiology

## COURSE DESCRIPTIONS

All course descriptions for all undergraduate programs can now be found in one large PDF called "All Course Descriptions" in the "Academic Calendar" section of the University website:

<http://uwinnipeg.ca/academics/calendar/index.html>