

# BIOLOGY (BIOL)

Updated Feb. 4, 2017

**Note: The department/program code BIOL replaces the former code 05. Students cannot hold credit in BIOL-xxxx and the former 05.xxxx having the same course number (e.g., BIOL-1115(3) and 05.1115(3)).**

**Chair: Professor Judith D. Huebner;** Professors Emeriti: W.S. Evans, G.E.E. Moodie, M. Novak, 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, D.A.H. Rittberg, L. Warszycki; Lab Manager: N. Tairari; Technical Staff: L.G. Buchanan, R. Cole, K. Kachur, D. Nickel, M. Rondeau, B. VanDekerkhove, 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

<b>ADMISSION REQUIREMENT</b>	Students should consult with a member of the Department in planning their course of study.
<b>GRADUATION REQUIREMENT</b>	90 credit hours
<b>RESIDENCE REQUIREMENT</b>	
Degree:	Minimum 30 credit hours
Major:	Minimum 18 credit hours
<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>MAJOR REQUIREMENT</b>	
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:	
<b>BIOL-1115(3)</b> Cells and Cellular Processes, and <b>BIOL-1116(3)</b> 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.

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

At least 15 additional 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-1803(3) Headline Chemistry News  
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
<b>GENERAL DEGREE REQUIREMENT</b>	
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.
<b>MAJOR REQUIREMENT</b>	
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:

**BIOL-1115(3)** Cells and Cellular Processes  
**BIOL-1116(3)** Evolution, Ecology and Biodiversity  
**BIOL-2301(3)** Genetics or the former **BIOL-3301(3)**  
**BIOL-2403(3)** Principles of Ecology (or former **BIOL-3403(3)**) or **BIOL-3902(3)** Microbial Ecology  
**BIOL-3221(3)** Cell Biology

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

At least 18 additional 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-1803(3) Headline Chemistry News  
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**

Students must complete minimum 42 credit hours in Biology above the 1000 level.

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

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

**ADMISSION REQUIREMENT**

Students must consult with the Department Advisor in planning their studies.

**GRADUATION REQUIREMENT**

Graduation G.P.A. Requirement

120 credit hours

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).

**RESIDENCE REQUIREMENT**

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

**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.

**HONOURS REQUIREMENT**

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-2111(6)** Comparative Chordate Zoology **OR** **BIOL-2115(3)** Biology of the Invertebrates
    - 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. 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-1803(3)** Headline Chemistry News
- 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



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-3161(3) Vegetative Anatomy & Physiology of Seed Plants 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-2111(6) Comparative Chordate Zoology  
 BIOL-2115(3) Biology of the Invertebrates  
 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-3161(3) Vegetative Anatomy and Physiology of Seed Plants  
 BIOL-3162(3) Reproductive Anatomy and Physiology of Seed Plants  
 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

#### 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-4931(3) Immunology

#### 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-3161(3) Vegetative Anatomy and Physiology of Seed Plants  
 BIOL-3162(3) Reproductive Anatomy and Physiology of Seed Plants  
 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

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-4931(3) Immunology

## COURSE DESCRIPTIONS

All course descriptions for all undergraduate programs can now be found in the back portion of the print Undergraduate Academic Calendar. They are also available in one large PDF in the "Academic Calendar" section of the University website:

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