

# NEUROSCIENCE (NSCI)

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**Note:** The department/program code is NSCI which replaces BPSY (Biopsychology)

## DEGREES/PROGRAMS OFFERED

**3-Year BSc**

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

**4-Year BSc**

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

**Honours BSc**

## INTRODUCTION

Neuroscience is the branch of the natural sciences concerned with how the brain and the nervous system control behaviour. Neuroscience is a rapidly developing research area that includes all aspects of the structure and function of the nervous systems of humans and nonhumans. This interdisciplinary area employs a variety of experimental strategies, including molecular, biochemical, anatomical, physiological, behavioural, cognitive, and developmental. Understanding neural processes has applications to a variety of health and psychosocial problems including stroke, Alzheimer's disease, Parkinsonism, and a wide variety of drug- or injury-induced behavioural and cognitive disorders. This program prepares students for further study in neuroscience, psychology, medicine, speech pathology, communication disorders and related fields.

Students pursuing a 3-year or 4-year BSc in Neuroscience 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.

## NOTE ON DEPARTMENT COURSE ADMISSION REQUIREMENTS

Neuroscience students are expected to meet course requirements specified by the department offering the courses. Please note that Psychology and Biology courses may have somewhat different requirements for registration in certain courses. For example, Biology requires no special permission to enroll in 4000-level courses in Biology, whereas Psychology requires academic advising and approval from the Honours Committee to register for 4000-level courses. Psychology approval normally requires (1) a minimum 3.0 GPA (B) in Psychology courses based on all attempts (including course repeats and failures), and (2) a minimum 2.5 GPA (C+) in all non-Psychology courses calculated as for the general degree (i.e., F's are not included, and in the case of repeated courses, only the highest grade is used). Exemptions to these requirements may be granted for admission to specific courses.

## REQUIREMENTS FOR THE 3-YEAR BSc IN NEUROSCIENCE

This allows program students with interests in the natural sciences to expand their knowledge of the neural basis of cognition and behavior.

### ADMISSION REQUIREMENT

Both Chemistry 40S and either Pre-Calculus or Applied Mathematics 40S are required for students wishing to pursue a BSc.

Entry into the program after completing a minimum of 30 credit hours.

A grade of C or better in PSYC-1000(6)

**GRADUATION REQUIREMENT** 90 credit hours

### RESIDENCE REQUIREMENT

Degree: Minimum 60 credit hours

Honours: Minimum 30 credit hours

### GENERAL DEGREE REQUIREMENT

Humanities: 12 credit hours in Humanities

Science: 18 credit hours in Science

Writing: Minimum 3 credit hours of Academic Writing

Indigenous: 3 credit hours in designated Indigenous requirement courses

Distribution: Minimum five (5) different subjects

### HONOURS REQUIREMENT

Single Major: Minimum 45 credit hours in the subject as per the Required Course list

Double Major: Minimum 45 credit hours in subject as per the Required Course list, and specified number of credit hours in other Major (may vary depending on interdisciplinary courses completed as they may be able to be credited to both Majors).

Required courses:

<b>PSYC-1000(6)</b>	Introductory Psychology
<b>CHEM-1111(3)</b>	Introduction to the Chemical Properties of Matter (or the former CHEM-1101(6))
<b>CHEM-1112(3)</b>	Basic Principles of Chemical Reactivity (or the former CHEM-1101(6))

<b>BIOL-1115(3)</b>	Cells and Cellular Processes (or the former BIOL-1111(6))
<b>BIOL-1116(3)</b>	Evolution, Ecology and Biodiversity (or the former BIOL-1111(6))
<b>CHEM-2202(3)</b>	Organic Chemistry I (or the former CHEM-2201(6))
<b>PSYC-2900(3)</b>	Physiological Psychology I
<b>BIOL-2301(3)</b>	Genetics (or the former BIOL-3301(3))
<b>PSYC-2101(3)</b>	Introduction to Data Analysis OR STAT-1501(3) Elementary Biological Statistics I OR STAT-1301(3) Statistical Analysis I
<b>PSYC-2102(3)</b>	Introduction to Research Methods

Minimum of 3 credit hours to be selected from Cognition and Behavior:

<b>PSYC-2600(3)</b>	Introduction to Cognitive Psychology
<b>PSYC-2610(3)</b>	Perception I
<b>PSYC-2800(3)</b>	Fundamentals of Animal Learning
<b>BIOL-2451(3)</b>	Introduction to Animal Behavior

Minimum of 3 credit hours to be selected from Human Neuroscience:

<b>PSYC-2620(3)</b>	Psycholinguistics
<b>PSYC-2920(3)</b>	Drugs & Behaviour
<b>PSYC-3600(3)</b>	Cognitive Processes
<b>PSYC-3910(3)</b>	Human Neuropsychology
<b>PSYC-3920(3)</b>	Cognitive Neuroscience

Minimum of 3 credit hours to be selected from Physiology:

<b>KIN-2301(3)</b>	Human Anatomy OR BIOL-1112 (6) Human Anatomy and Physiology
<b>PSYC-3900(3)</b>	Physiological Psychology II
<b>PHYS-2503(3)</b>	Medical Imaging
<b>BIOL-3602(3)</b>	Comparative Animal Physiology I (or the former BIOL-3601(6))
<b>BIOL-3603(3)</b>	Comparative Animal Physiology II (or the former BIOL-3601(6))
<b>BIOL-2111(3)</b>	Comparative Chordate Zoology

Minimum of 3 credit hours to be selected from Molecular and Cellular:

<b>BIOL-3221(3)</b>	Cell Biology
<b>BIOL-3303(3)</b>	Molecular Genetics and Genomics (or the former BIOL-4302(3))
<b>CHEM-2203(3)</b>	Organic Chemistry II (or the former CHEM-2201(6))
<b>CHEM-3502(3)</b>	Intermediate Biochemistry I: Structure, Function, and Energetics of Biomolecules
<b>CHEM-3503(3)</b>	Intermediate Biochemistry II: Intermediary Metabolism
<b>BIOL-3202(3)</b>	Histology

**Advisory:** Students are advised that a 3-year BSc is not normally sufficient for admission to graduate studies. Students normally enroll in **PSYC-2101(3)** and **PSYC-2102(3)** in their 2nd year.

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

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

## REQUIREMENTS FOR THE 4-YEAR BSc IN NEUROSCIENCE

This allows program students with interests in the natural sciences to expand their knowledge of the neural basis of behavior and cognition. Students are required to consult with a Departmental Honours Advisor at the time they enrol in 4000-level courses in the Psychology Department. Appointments for advising are arranged through the departmental secretary at 786-9130. Enrolling in 4000-level courses in the Biology department does not require a consultation with a faculty member.

### ADMISSION REQUIREMENT

Students are required to consult with a Program Advisor or Coordinator in planning their course of study. Both Chemistry 40S and either Pre-Calculus or Applied Mathematics 40S are required for students wishing to pursue a BSc (Hons). Entry into the program after completing a minimum of 30 credit hours. A grade of C or better in PSYC-1000(6)

**GRADUATION REQUIREMENT** 120 credit hours

**GRADUATION GPA REQUIREMENT** Graduation minimum GPA is 2.5 (C+) in major subject courses (Neuroscience).  
Minimum 2.5 GPA (C+) based on all attempts (including course repeats and failures) in Neuroscience courses.  
Minimum 2.5 GPA (C+) in all non-major subject courses 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

## GENERAL DEGREE REQUIREMENT

Humanities: 12 credit hours in Humanities  
Science: 18 credit hours in Science  
Writing: Minimum 3 credit hours of Academic Writing  
Indigenous: 3 credit hours in designated Indigenous requirement courses  
Distribution: Minimum five (5) different subjects

## MAJOR REQUIREMENT

Single Major: Minimum 63 credit hours in the subject as per the Required Course list  
Double Major: Minimum 63 credit hours in subject as per the Required Course list, and specified number of credit hours in other Major (may vary depending on interdisciplinary courses completed as they may be able to be credited to both Majors).

### Required courses:

**PSYC-1000(6)** Introductory Psychology  
**CHEM-1111(3)** Introduction to the Chemical Properties of Matter (or the former CHEM-1101(6))  
**CHEM-1112(3)** Basic Principles of Chemical Reactivity (or the former CHEM-1101(6))  
**BIOL-1115(3)** Cells and Cellular Processes (or the former BIOL-1111(6))  
**BIOL-1116(3)** Evolution, Ecology and Biodiversity (or the former BIOL-1111(6))  
  
**CHEM-2202(3)** Organic Chemistry I (or the former CHEM-2201(6))  
**PSYC-2900(3)** Physiological Psychology I  
**BIOL-2301(3)** Genetics (or the former BIOL-3301(3))  
**PSYC-2101(3)** Introduction to Data Analysis OR STAT-1501(3) Elementary Biological Statistics I OR STAT-1301(3) Statistical Analysis I  
**PSYC-2102(3)** Introduction to Research Methods

### Minimum of 3 credit hours to be selected from Cognition and Behavior:

**PSYC-2600(3)** Introduction to Cognitive Psychology  
**PSYC-2610(3)** Perception I  
**PSYC-2800(3)** Fundamentals of Animal Learning  
**BIOL-2451(3)** Introduction to Animal Behavior

### Minimum of 6 credit hours to be selected from Human Neuroscience:

**PSYC-2620(3)** Psycholinguistics  
**PSYC-2920(3)** Drugs & Behaviour  
**PSYC-3600(3)** Cognitive Processes  
**PSYC-3910(3)** Human Neuropsychology  
**PSYC-3920(3)** Cognitive Neuroscience

### Minimum of 6 credit hours to be selected from Physiology:

**KIN-2301(3)** Human Anatomy OR BIOL-1112 (6) Human Anatomy and Physiology  
**PSYC-3900(3)** Physiological Psychology II  
**PHYS-2503(3)** Medical Imaging  
**BIOL-3602(3)** Comparative Animal Physiology I (or the former BIOL-3601(6))  
**BIOL-3603(3)** Comparative Animal Physiology II (or the former BIOL-3601(6))  
**BIOL-2111(3)** Comparative Chordate Zoology

### Minimum of 6 credit hours to be selected from Molecular and Cellular:

**BIOL-3221(3)** Cell Biology  
**BIOL-3303(3)** Molecular Genetics and Genomics (or the former BIOL-4302(3))  
**CHEM-2203(3)** Organic Chemistry II (or the former CHEM-2201(6))  
**CHEM-3502(3)** Intermediate Biochemistry I: Structure, Function, and Energetics of Biomolecules  
**CHEM-3503(3)** Intermediate Biochemistry II: Intermediary Metabolism  
**BIOL-3202(3)** Histology

### Minimum of 9 credit hours total with a minimum of 3 credit hours in each of PSY and BIOL to be selected from:

**PSYC-4900(3)** Topics in Physiological Psychology  
**PSYC-4920(3)** Topics in Cognitive Neuroscience  
**PSYC-4800(3)** Topics in Animal Learning  
**PSYC-4820(3)** Neurobiology of Addiction and Fear  
**PSYC-4830(3)** Genes, Evolution, and Behaviour  
**PSYC-4600(3)** Topics in Human Learning and Memory  
**PSYC-4610(3)** Topics in Perception  
**PSYC-4630(3)** Topics in Cognitive Psychology

<b>PSYC-4730(3)</b>	Biological Considerations in Clinical Psychology
<b>BIOL-4950(3)</b>	Neurobiology
<b>BIOL-4601(3)</b>	Ecological Animal Physiology
<b>BIOL-4602(3)</b>	Field Research in Animal Ecology and Energetics
<b>BIOL-4501(3)</b>	Developmental Biology
<b>BIOL-4502(3)</b>	Molecular Cell Biology
<b>BIOL-4931(3)</b>	Immunology
<b>PSYC-4010(3)</b>	Directed Readings with approval by Neuroscience faculty
<b>PSYC-4020(3)</b>	Directed Readings with approval by Neuroscience faculty
<b>BIOL-4191(3)</b>	Directed Studies in Biology with approval by Neuroscience faculty

**Advisory:** Students are advised that a 4-year BSc is not normally sufficient for admission to graduate studies. Students normally enrol in **PSYC-2101(3)** and **PSYC-2102(3)** in their 2nd year.

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

Students must complete the requirements of the 4-year BSc in Neuroscience (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 NEUROSCIENCE

This program allows students with demonstrated ability an opportunity to deal more extensively and intensively with the subject matter. Students are required to consult with a Departmental Honours Advisor at the time they enroll in 4000-level courses in the Psychology Department. Appointments for advising are arranged through the departmental secretary at 786-9130. Enrolling in 4000-level courses in the Biology department does not require a consultation with a faculty member.

### ADMISSION REQUIREMENT

Students are required to consult with a Program Advisor or Coordinator in planning their course of study. Both Chemistry 40S and either Pre-Calculus or Applied Mathematics 40S are required for students wishing to pursue a BSc (Hons). Entry into the program after completing a minimum of 30 credit hours. A grade of C or better in PSYC-1000(6)

### GRADUATION REQUIREMENT

120 credit hours

**GRADUATION GPA REQUIREMENT** Graduation minimum GPA is 3.0 (B) in Honours (4000-level) subject courses and 2.75 in non-Honours (1000-, 2000-, and 3000- level) subject courses. Minimum 3.0 GPA (B) based on all attempts (including course repeats and failures). Minimum 2.75 GPA (C+) in all non-Honours Subject courses 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

### GENERAL DEGREE REQUIREMENT

Humanities: 12 credit hours in Humanities  
Science: 18 credit hours in Science  
Writing: Minimum 3 credit hours of Academic Writing  
Indigenous: 3 credit hours in designated Indigenous requirement courses  
Distribution: Minimum five (5) different subjects

### HONOURS REQUIREMENT

Single Major: Minimum 78 credit hours in the subject as per the Required Course list  
Double Major: Minimum 78 credit hours in subject as per the Required Course list, and specified number of credit hours in other Major (may vary depending on interdisciplinary courses completed as they may be able to be credited to both Majors).

Required courses:

<b>PSYC-1000(6)</b>	Introductory Psychology
<b>CHEM-1111(3)</b>	Introduction to the Chemical Properties of Matter (or the former CHEM-1101(6))
<b>CHEM-1112(3)</b>	Basic Principles of Chemical Reactivity (or the former CHEM-1101(6))
<b>BIOL-1115(3)</b>	Cells and Cellular Processes (or the former BIOL-1111(6))
<b>BIOL-1116(3)</b>	Evolution, Ecology and Biodiversity (or the former BIOL-1111(6))
<b>CHEM-2202(3)</b>	Organic Chemistry I (or the former CHEM-2201(6))
<b>PSYC-2900(3)</b>	Physiological Psychology I
<b>BIOL-2301(3)</b>	Genetics (or the former BIOL-3301(3))

**PSYC-2101(3)** Introduction to Data Analysis OR STAT-1501(3) Elementary Biological Statistics I OR  
 STAT-1301(3) Statistical Analysis I  
**PSYC-2102(3)** Introduction to Research Methods  
**PSYC-4100(6)** Intermediate Research Design and Data Analysis  
**BIOL-4111(6)** Biology Honours Thesis OR PSYC-4040(6) Honours Thesis in a Natural Science area of  
 Psychology approved by Neuroscience faculty members

Minimum of 3 credit hours to be selected from Cognition and Behavior:

**PSYC-2600(3)** Introduction to Cognitive Psychology  
**PSYC-2610(3)** Perception I  
**PSYC-2800(3)** Fundamentals of Animal Learning  
**BIOL-2451(3)** Introduction to Animal Behavior

Minimum of 6 credit hours to be selected from Human Neuroscience:

**PSYC-2620(3)** Psycholinguistics  
**PSYC-2920(3)** Drugs & Behaviour  
**PSYC-3600(3)** Cognitive Processes  
**PSYC-3910(3)** Human Neuropsychology  
**PSYC-3920(3)** Cognitive Neuroscience

Minimum of 6 credit hours to be selected from Physiology:

**KIN-2301(3)** Human Anatomy OR BIOL-1112 (6) Human Anatomy and Physiology  
**PSYC-3900(3)** Physiological Psychology II  
**PHYS-2503(3)** Medical Imaging  
**BIOL-3602(3)** Comparative Animal Physiology I (or the former BIOL-3601(6))  
**BIOL-3603(3)** Comparative Animal Physiology II (or the former BIOL-3601(6))  
**BIOL-2111(3)** Comparative Chordate Zoology

Minimum of 6 credit hours to be selected from Molecular and Cellular:

**BIOL-3221(3)** Cell Biology  
**BIOL-3303(3)** Molecular Genetics and Genomics (or the former BIOL-4302(3))  
**CHEM-2203(3)** Organic Chemistry II (or the former CHEM-2201(6))  
**CHEM-3502(3)** Intermediate Biochemistry I: Structure, Function, and Energetics of Biomolecules  
**CHEM-3503(3)** Intermediate Biochemistry II: Intermediary Metabolism  
**BIOL-3202(3)** Histology

Minimum of 12 credit hours total with a minimum of 3 credit hours in each of PSY and BIOL to be selected from:

**PSYC-4900(3)** Topics in Physiological Psychology  
**PSYC-4920(3)** Topics in Cognitive Neuroscience  
**PSYC-4800(3)** Topics in Animal Learning  
**PSYC-4820(3)** Neurobiology of Addiction and Fear  
**PSYC-4830(3)** Genes, Evolution, and Behaviour  
**PSYC-4600(3)** Topics in Human Learning and Memory  
**PSYC-4610(3)** Topics in Perception  
**PSYC-4630(3)** Topics in Cognitive Psychology  
**PSYC-4730(3)** Biological Considerations in Clinical Psychology  
**BIOL-4950(3)** Neurobiology  
**BIOL-4601(3)** Ecological Animal Physiology  
**BIOL-4602(3)** Field Research in Animal Ecology and Energetics  
**BIOL-4501(3)** Developmental Biology  
**BIOL-4502(3)** Molecular Cell Biology  
**BIOL-4931(3)** Immunology  
**PSYC-4010(3)** Directed Readings with approval by Neuroscience faculty  
**PSYC-4020(3)** Directed Readings with approval by Neuroscience faculty  
**BIOL-4191(3)** Directed Studies in Biology with approval by Neuroscience faculty