

# STATISTICS (STAT)

Updated Apr. 8, 2019

**Chair:** A. Stokke; **Professor:** M. Ghahramani; ; **Associate Professors:** J. Babb; S. Hossain; **Assistant Professor:** Z. Mashreghi;  
**Instructors:** B. Bector, S. Khan, M. Nasri

## DEGREES/PROGRAMS OFFERED

**3-Year BA**

**3-Year BSc**

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

**4-Year BA**

**4-Year BSc**

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

**Minor**

## INTRODUCTION

Statistics is the science of data collection, summarization, analysis, and interpretation. A central issue of statistics is how to make inferences about populations of interest, using data obtained from samples or designed experiments. Statistical techniques are applied extensively in virtually every branch of the physical, social, biological, and human sciences. Statistical methodologies and principles of inference are based heavily upon statistical theory, which, in turn has an essential underlying mathematical foundation. Computer software is typically used for statistical analysis of large data sets.

The Statistics Department offers 3-Year and 4-Year BA or BSc degree programs. Students pursuing a 3-year or 4-year BSc in Statistics also have the opportunity to take a Business Stream (see the “Science with a Business Stream” section of this Course Calendar).

As a student of Statistics, one may study theoretical statistics and probability theory, which focuses on the logical development of statistical methods. One may also take courses which focus on the application of statistical methodology to data sets from a variety of disciplines. The Statistics Department also offers courses in simulation, operations research, and stochastic modeling.

Students who are not Statistics majors will find that a background in statistics is valuable in many areas. Students considering graduate study in various fields may benefit from many of our applied courses. For some programs, certain Statistics courses are required. An understanding of statistical concepts is important for numerical literacy.

Statisticians often work collaboratively with specialists in other fields to develop methodologies and analyze data for research studies. They may assist economists in the analysis of consumer prices, or with the design and analysis of large-scale socioeconomic surveys. Statisticians may help biologists, chemists and engineers in the design and analysis of experiments, or work with medical researchers to test the effectiveness of new drugs. They may also work with researchers in fields such as agriculture, anthropology, climatology, education, epidemiology, and geography. Other opportunities can be found in finance, marketing, and quality management. Many statisticians find employment with private corporations and government agencies, including Statistics Canada.

## REQUIREMENTS FOR A 3-YEAR BA/BSc IN STATISTICS

**ADMISSION REQUIREMENT** Students must 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: 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. As a result, students must take a minimum of 48 credit hours at the 2000-level or above in order to not exceed the maximum number of introductory courses.

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

Required courses:

Core Courses

<b>STAT-1301(3)</b>	Statistical Analysis I <u>AND</u>
<b>STAT-1302(3)</b>	Statistical Analysis II <u>OR</u> the former STAT-1201(6) Introduction to Statistical Analysis <u>OR</u>
<b>STAT-1501(3)</b>	Elementary Biological Statistics I <u>AND</u>
<b>STAT-2001(3)</b>	Elementary Biological Statistics II or the former STAT-1601(3) Elementary Biological Statistics II
<b>STAT-2301(3)</b>	Survey Sampling I
<b>STAT-2903(3)</b>	Introduction to Statistical Computing
<b>STAT-3103(3)</b>	Statistics in Research I
<b>STAT-3104(3)</b>	Analysis of Variance and Covariance
<b>STAT/MATH-3611(3)</b>	Mathematical Statistics I
<b>STAT/MATH-3612(3)</b>	Mathematical Statistics II

6 credit hours from:

<b>STAT-2102(3)</b>	Business and Management Statistics
<b>STAT-2103(3)</b>	Intermediate Biological Statistics
<b>STAT-2104(3)</b>	Nonparametric Statistics
<b>STAT/MATH-2413(3)</b>	Introduction to Mathematical Finance
<b>STAT-2501(3)</b>	Statistical Quality Control
<b>STAT-3102(3)</b>	Applied Multivariate Methods
<b>STAT-3105(3)</b>	Time Series and Forecasting
<b>STAT-3401(3)</b>	Stochastic Processes
<b>STAT/MATH-3412(3)</b>	Introduction to Operations Research
<b>STAT-3501(3)</b>	Simulation
<b>STAT-3602(3)</b>	Demography
<b>STAT-3701(3)</b>	Epidemiology
<b>STAT-4501(3)</b>	Spatial Statistics
<b>STAT-4601(3)</b>	Statistical Design of Experiments

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

Prescribed courses: To be determined in consultation with the Department.

Students who have not obtained a grade of at least C in both **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 **STAT-2001(3)** Elementary Biological Statistics II (or the former **STAT-1601(3)** Elementary Biological Statistics II) are advised not to proceed in a Statistics major.

**MATH-2105(3)** Intermediate Calculus I and **MATH-2106(3)** Intermediate Calculus II or the former **MATH-2101(6)**

Intermediate Calculus is a prerequisite for **STAT/MATH-3611(3)** (formerly STAT-3201(3)) Mathematical Statistics I.

**MATH-1201(3)** Linear Algebra I AND **MATH-2203(3)** Linear Algebra II or the former **MATH-2201(6)** Linear Algebra is a prerequisite for **STAT-3102(3)** Applied Multivariate Methods.

**MATH-1201(3)** Linear Algebra I AND **MATH-2203(3)** Linear Algebra II or the former **MATH-2201(6)** Linear Algebra is a prerequisite for **STAT/MATH-3412(3)** Introduction to Operations Research.

Students are advised to take **MATH-1103 (3)** Introduction to Calculus I AND **MATH-1104 (3)** Introduction to Calculus II or

**MATH-1101(6)** Introduction to Calculus in their first year, and **MATH-2105(3)** Intermediate Calculus I and **MATH-2106(3)**

Intermediate Calculus II or the former **MATH-2101(6)** Intermediate Calculus, **MATH-1201(3)** Linear Algebra I AND **MATH-2203(3)** Linear Algebra II or the former **MATH-2201(6)** Linear Algebra in their second year.

Students planning to go on to graduate studies are advised to consult with the Department before choosing second year courses.

Students planning to seek employment upon graduation with a Statistics major are strongly advised to take **STAT-2103(3)**

Intermediate Biological Statistics as part of the major, and to consider taking as many as possible of the following courses in Applied Computer Science or Mathematics: **MATH-3701(3)**, **ACS-1903(3)**, **ACS-1904(3)**.

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

Students must complete the requirements of the 3-year BSc in Statistics 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 BA/BSc IN STATISTICS

**ADMISSION REQUIREMENT** 30 credit hours previously completed in BA/BSc

**GRADUATION REQUIREMENT** 120 credit hours

**RESIDENCE REQUIREMENT**

Degree: 60 credit hours  
Major: 30 credit hours

**GENERAL DEGREE REQUIREMENT**

Humanities: 12 credit hours in Humanities  
Social Sciences (BA only): 12 credit hours  
Writing: Minimum three (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. As a result, students must take a minimum of 78 credit hours at the 2000-level or above in order to not exceed the maximum number of introductory courses.  
Distribution: Minimum three (3) credit hours from each of five (5) different subjects.

**MAJOR REQUIREMENT**

Major: Minimum 48 credit hours/Maximum 66 credit hours.  
Double Major: Minimum 48 credit hours in each Major as specified by the department/program.

Required Courses:  
Core Courses

<b>STAT-1301(3)</b>	Statistical Analysis I <u>AND</u>
<b>STAT-1302(3)</b>	Statistical Analysis II <u>OR</u> the former STAT-1201(6) Introduction to Statistical Analysis <u>OR</u>
<b>STAT-1501(3)</b>	Elementary Biological Statistics I <u>AND</u>
<b>STAT-2001(3)</b>	Elementary Biological Statistics II or the former STAT-1601(3) Elementary Biological Statistics II
<b>STAT-2301(3)</b>	Survey Sampling I
<b>STAT-2903(3)</b>	Introduction to Statistical Computing
<b>STAT-3103(3)</b>	Statistics in Research I
<b>STAT-3104(3)</b>	Analysis of Variance and Covariance
<b>STAT/MATH-3611(3)</b>	Mathematical Statistics I
<b>STAT/MATH-3612(3)</b>	Mathematical Statistics II
<b>STAT-4202(3)</b>	Statistical Inference

18 credit hours from:

<b>STAT-2102(3)</b>	Business and Management Statistics
<b>STAT-2103(3)</b>	Intermediate Biological Statistics
<b>STAT-2104(3)</b>	Nonparametric Statistics
<b>STAT/MATH-2413(3)</b>	Introduction to Mathematical Finance
<b>STAT-2501(3)</b>	Statistical Quality Control
<b>STAT-3102(3)</b>	Applied Multivariate Methods
<b>STAT-3105(3)</b>	Time Series and Forecasting
<b>STAT-3401(3)</b>	Stochastic Processes
<b>STAT/MATH-3412(3)</b>	Introduction to Operations Research

<b>STAT-3501(3)</b>	Simulation
<b>STAT-3602(3)</b>	Demography
<b>STAT-3701(3)</b>	Epidemiology

3 credit hours from:

<b>STAT-4102(3)</b>	Survival and Reliability Analysis
<b>STAT-4401(3)</b>	Probability Theory
<b>STAT-4601(3)</b>	Statistical Design of Experiments
<b>STAT-4501(3)</b>	Spatial Statistics

Students who have not obtained a grade of at least C in both **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 **STAT-2001(3)** Elementary Biological Statistics II (or the former **STAT-1601(3)** Elementary Biological Statistics II) are advised not to proceed in a Statistics major.

**MATH-2105(3)** Intermediate Calculus I and **MATH-2106(3)** Intermediate Calculus II or the former **MATH-2101(6)** Intermediate Calculus is a prerequisite for **STAT/MATH-3611(3)** (formerly STAT-3201(3)) Mathematical Statistics I.

**MATH-1201(3)** Linear Algebra I AND **MATH-2203(3)** Linear Algebra II or the former **MATH-2201(6)** Linear Algebra is a prerequisite for **STAT-3102(3)** Applied Multivariate Methods.

**MATH-1201(3)** Linear Algebra I AND **MATH-2203(3)** Linear Algebra II or the former **MATH-2201(6)** Linear Algebra is a prerequisite for **STAT/MATH-3412(3)** Introduction to Operations Research. Students are advised to take **MATH-1103 (3)** Introduction to Calculus I AND **MATH-1104 (3)** Introduction to Calculus II or **MATH-1101(6)** Introduction to Calculus in their first year, and **MATH-2105(3)** Intermediate Calculus I and **MATH-2106(3)** Intermediate Calculus II or the former **MATH-2101(6)** Intermediate Calculus, **MATH-1201(3)** Linear Algebra I AND **MATH-2203(3)** Linear Algebra II or the former **MATH-2201(6)** Linear Algebra in their second year.

Students planning to go on to graduate studies are advised to consult with the Department before choosing second year courses. Students planning to seek employment on graduation with a Statistics major are strongly advised to take **STAT-2103(3)** Intermediate Biological Statistics as part of the major, and to consider taking as many as possible of the following courses in Applied Computer Science or Mathematics: **MATH-3701(3)**, **ACS-1903(3)**, **ACS-1904(3)**.

Combined Major: Minimum 60 credit hours from 2 different majors with not less than 24 credit hours from each major subject.  
 Prescribed courses: To be determined in consultation with the Department

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

Students must complete the requirements of the 4-year BSc in Statistics 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 MINOR IN STATISTICS

Degree: Students completing any undergraduate degree program are eligible to complete the Minor.  
 Minor: 18 credit hours in the Minor subject, with a minimum of 12 credit hours above the 1000-level  
 Residence Requirement: Minimum 12 credit hours in the Minor subject  
 Required courses: **STAT-1301(3)** and **STAT-1302(3)** (or the former **STAT-1201(6)**)  
 OR both **STAT-1501(3)** and **STAT-2001(3)** (formerly **STAT-1601(3)**)  
**STAT-2301(3)** Survey Sampling  
 Any other nine credit hours at the 2000 level or higher (not including **STAT-2001(3)**)  
 Restrictions: Students cannot declare the same subject as a Major and a Minor.

### GENERAL INFORMATION

#### Prerequisites

Pre-Calculus Mathematics 40S or Applied Mathematics 40S.

## COURSE LISTINGS

<b>STAT-1301(3)</b>	Statistical Analysis I	<b>STAT-3401(3)</b>	Stochastic Processes
<b>STAT-1302(3)</b>	Statistical Analysis II	<b>STAT/MATH-3412(3)</b>	Introduction to Operations Research
<b>STAT-1401(3)</b>	Statistics I for Business and Economics	<b>STAT-3501(3)</b>	Simulation
<b>STAT-1501(3)</b>	Elementary Biological Statistics I	<b>STAT-3602(3)</b>	Demography
<b>STAT-2001(3)</b>	Elementary Biological Statistics II	<b>STAT/MATH-3611(3)</b>	Mathematical Statistics I
<b>STAT-2102(3)</b>	Business and Management Statistics	<b>STAT/MATH-3612(3)</b>	Mathematical Statistics II
<b>STAT-2103(3)</b>	Intermediate Biological Statistics	<b>STAT-3701(3)</b>	Epidemiology
<b>STAT-2104(3)</b>	Nonparametric Statistics	<b>STAT-4102(3)</b>	Survival and Reliability Analysis
<b>STAT-2301(3)</b>	Survey Sampling I	<b>STAT-4202(3)</b>	Statistical Inference
<b>STAT-MATH-2413(3)</b>	Introduction to Mathematical Finance	<b>STAT-4401(3)</b>	Probability Theory
<b>STAT-2501(3)</b>	Statistical Quality Control	<b>STAT-4501(3)</b>	Spatial Statistics
<b>STAT-2903(3)</b>	Introduction to Statistical Computing	<b>STAT-4601(3)</b>	Statistical Design of Experiments
<b>STAT-3102(3)</b>	Applied Multivariate Methods	<b>EXPERIMENTAL COURSE</b>	
<b>STAT-3103(3)</b>	Statistics in Research I	<b>STAT-3302(3)</b>	Survey Sampling II
<b>STAT-3104(3)</b>	Analysis of Variance and Covariance		
<b>STAT-3105(3)</b>	Time Series and Forecasting		

## 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>