STATISTICS (STAT)

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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)
4-Year BA (Data Science Stream)
4-Year BSc (Data Science 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 4-year BSc or BA in Statistics have the opportunity to take a Data Science Stream. 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:	**STAT-1301(3)**	Statistical Analysis I OR
Core Courses	**STAT-1401(3)**	Statistics I for Business and Economics OR
	STAT-1501(3)	Elementary Biological Statistics I
	STAT-1302(3)	Statistical Analysis II OR
	STAT-2001(3)	Elementary Biological Statistics II
	STAT-2301(3)	Survey Sampling I
	STAT/MATH-2612(3)	Mathematical Statistics I or the former STAT/MATH-3611
	STAT-2903(3)	Statistical Computing I
	STAT-3103(3)	Applied Regression Analysis
	STAT-3104(3)	Analysis of Variance and Covariance
	STAT/MATH-3612(3)	Mathematical Statistics II
	MATH-1101(6)	Introduction to Calculus OR
	MATH-1103(3)	Introduction to Calculus I AND
	MATH-1104(3)	Introduction to Calculus II
	MATH-1201(3)	Linear Algebra I
	MATH-2105(3)	Intermediate Calculus I
	MATH-2106(3)	Intermediate Calculus II

6 credit hours from:	**STAT-2102(3)**	Business and Management Statistics
	STAT-2103(3)	Intermediate Biological Statistics
	STAT-2104(3)	Nonparametric Statistics
	STAT/MATH-2413(3)	Introduction to Mathematical Finance
	STAT-2702(3)	Statistics for Epidemiology or the former STAT-3701
	STAT-3102(3)	Applied Multivariate Methods
	STAT-3105(3)	Time Series and Forecasting
	STAT-3302(3)	Survey Sampling II
	STAT/MATH-3412(3)	Introduction to Operations Research
	STAT-3501(3)	Simulation
	STAT-3904(3)	Statistical Computing II
	STAT-4103(3)	Statistical Learning
	STAT-4202(3)	Statistical Inference
	STAT-4401(3)	Probability Theory
	STAT-4501(3)	Spatial Statistics
	STAT-4601(3)	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 (OR **STAT-1401(3)** Statistics I for Business and Economics OR **STAT-1501(3)** Elementary Biological Statistics I) AND **STAT-1302(3)** Statistical Analysis II (OR **STAT 2001(3)** Elementary Biological Statistics II) are advised not to proceed in a Statistics major.
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; **MATH-1201(3)** Linear Algebra I in their first or second year; and **MATH-2105(3)** Intermediate Calculus I, **MATH-2106(3)** Intermediate Calculus II, AND **MATH-2203(3)** Linear Algebra II in their second year.

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

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

Required Courses: Core Courses	**STAT-1301(3)**	Statistical Analysis I OR
	STAT-1401(3)	Statistics I for Business and Economics OR
	STAT-1501(3)	Elementary Biological Statistics I
	STAT-1302(3)	Statistical Analysis II OR
	STAT-2001(3)	Elementary Biological Statistics II
	STAT-2301(3)	Survey Sampling I
	STAT/MATH-2612(3)	Mathematical Statistics I or the former STAT/MATH-3611
	STAT-2903(3)	Statistical Computing I
	STAT-3103(3)	Applied Regression Analysis
	STAT-3104(3)	Analysis of Variance and Covariance
	STAT/MATH-3612(3)	Mathematical Statistics II
	STAT-4202(3)	Statistical Inference
	MATH-1101(6)	Introduction to Calculus OR
	MATH-1103(3)	Introduction to Calculus I AND
	MATH-1104(3)	Introduction to Calculus II
	MATH-1201(3)	Linear Algebra I
	MATH-2105(3)	Intermediate Calculus I
	MATH-2106(3)	Intermediate Calculus II
21 additional credit hours with at least one from 4000 level from the following list:	**STAT-2102(3)**	Business and Management Statistics
	STAT-2103(3)	Intermediate Biological Statistics
	STAT-2104(3)	Nonparametric Statistics
	STAT/MATH-2413(3)	Introduction to Mathematical Finance
	STAT-2702(3)	Statistics for Epidemiology or the former STAT-3701
	STAT-3102(3)	Applied Multivariate Methods
	STAT-3105(3)	Time Series and Forecasting
	STAT-3302(3)	Survey Sampling II
	STAT/MATH-3412(3)	Introduction to Operations Research
	STAT-3501(3)	Simulation
	STAT-3904(3)	Statistical Computing II
	STAT-4103(3)	Statistical Learning
	STAT-4401(3)	Probability Theory
	STAT-4501(3)	Spatial Statistics
	STAT-4601(3)	Statistical Design of Experiments

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.

Students who have not obtained a grade of at least C in both **STAT-1301(3)** Statistical Analysis I (OR **STAT-1401(3)** Statistics I for Business and Economics OR **STAT-1501(3)** Elementary Biological Statistics I) AND **STAT-1302(3)** Statistical Analysis II (OR **STAT 2001(3)** Elementary Biological Statistics II) are advised not to proceed in a Statistics major.
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; **MATH-1201(3)** Linear Algebra I in their first or second year; and **MATH-2105(3)** Intermediate Calculus I, **MATH-2106(3)** Intermediate Calculus II, AND **MATH-2203(3)** Linear Algebra II in their second year.
Students planning to go on to graduate studies are advised to consult with the Department before choosing second year courses.

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 4-YEAR BA/BSc IN STATISTICS (DATA SCIENCE STREAM)

ADMISSION REQUIREMENT		30 credit hours previously completed in BA/BSc
GRADUATION REQUIREMENT		120 credit hours
RESIDENCE REQUIREMENT		60 credit hours
Degree:		30 credit hours
Major:		
GENERAL DEGREE REQUIREMENT		12 credit hours in Humanities
Humanities:		12 credit hours
Social Sciences (BA only):		Minimum three (3) credit hours of Academic Writing
Writing:		3 credit hours in designated Indigenous requirement 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.
Indigenous:		
Maximum Introductory Courses:		
Distribution:		Minimum three (3) credit hours from each of five (5) different subjects.
MAJOR REQUIREMENT		
Major:		Minimum of 75 credit hours as per the courses listed below.
Double Major:		Minimum of 75 credit hours as per the courses listed below.
Required Courses:		
Core Courses	**STAT-1301(3)**	Statistical Analysis I OR
	STAT-1401(3)	Statistics I for Business and Economics OR
	STAT-1501(3)	Elementary Biological Statistics I
	STAT-1302(3)	Statistical Analysis II OR
	STAT-2001(3)	Elementary Biological Statistics II
	STAT-2301(3)	Survey Sampling I
	STAT/MATH-2612(3)	Mathematical Statistics I or the former STAT/MATH-3611
	STAT-2903(3)	Statistical Computing I
	STAT-3103(3)	Applied Regression Analysis
	STAT-3102(3)	Applied Multivariate Methods OR
	STAT-3104(3)	Analysis of Variance and Covariance OR
	STAT-3105(3)	Time Series and Forecasting
	STAT/MATH-3612(3)	Mathematical Statistics II
	STAT-4103(3)	Statistical Learning
	STAT-4202(3)	Statistical Inference
	MATH-1101(6)	Introduction to Calculus OR
	MATH-1103(3)	Introduction to Calculus I AND
	MATH-1104(3)	Introduction to Calculus II
	MATH-1201(3)	Linear Algebra I
	MATH-2105(3)	Intermediate Calculus I
	MATH-2106(3)	Intermediate Calculus II
	MATH-2203(3)	Linear Algebra II
	ACS-1903(3)	Programming Fundamentals I
	ACS-1904(3)	Programming Fundamentals II
	ACS-2814(3)	Application of Database Systems
	ACS-2947(3)	Data Structures and Algorithms
	ACS-3902(3)	Database Systems
	ACS-4953(3)	Introduction to Machine Learning
9 additional credit hours from:	**STAT-2102(3)**	Business and Management Statistics
	STAT-2103(3)	Intermediate Biological Statistics
	STAT-2104(3)	Nonparametric Statistics
	STAT/MATH-2413(3)	Introduction to Mathematical Finance
	STAT-2702(3)	Statistics for Epidemiology or the former STAT-3701
	STAT-3102(3)	Applied Multivariate Methods

STAT-3104(3)	Analysis of Variance and Covariance
STAT-3105(3)	Time Series and Forecasting
STAT-3302(3)	Survey Sampling II
STAT/MATH-3412(3)	Introduction to Operations Research
STAT-3501(3)	Simulation
STAT-3904(3)	Statistical Computing II
STAT-4401(3)	Probability Theory
STAT-4501(3)	Spatial Statistics
STAT-4601(3)	Statistical Design of Experiments

If **STAT-3102(3), STAT-3104(3)** or **STAT-3105(3)** is taken as a core course, it cannot be used towards the 9 additional credit hours requirement.
Students who have not obtained a grade of at least C in both **STAT-1301(3)** Statistical Analysis I (OR **STAT-1401(3)** Statistics I for Business and Economics OR **STAT-1501(3)** Elementary Biological Statistics I) AND **STAT-1302(3)** Statistical Analysis II (OR **STAT-2001(3)** Elementary Biological Statistics II) are advised not to proceed in a Statistics major.
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; **MATH-1201(3)** Linear Algebra I in their first or second year; and **MATH-2105(3)** Intermediate Calculus I, **MATH-2106(3)** Intermediate Calculus II, AND **MATH-2203(3)** Linear Algebra II in their second year.
Students planning to go on to graduate studies are advised to consult with the Department before choosing second year courses.

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

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)** Statistical Analysis I OR **STAT-1401(3)** Statistics for Business and Economics OR
STAT-1501(3) Elementary Biological Statistics I
STAT-1302(3) Statistical Analysis II OR **STAT-2001(3)** Elementary Biological Statistics II
STAT-2301(3) Survey Sampling I
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

STAT-1301(3)	Statistical Analysis I
STAT-1302(3)	Statistical Analysis II
STAT-1401(3)	Statistics I for Business and Economics
STAT-1501(3)	Elementary Biological Statistics I
STAT-2001(3)	Elementary Biological Statistics II
STAT-2102(3)	Business and Management Statistics
STAT-2103(3)	Intermediate Biological Statistics
STAT-2104(3)	Nonparametric Statistics
STAT-2301(3)	Survey Sampling I
STAT-MATH-2413(3)	Introduction to Mathematical Finance
STAT/MATH-2612(3)	Mathematical Statistics I or the former STAT/MATH-3611
STAT-2702(3)	Statistics for Epidemiology or the former STAT-3701
STAT-2903(3)	Statistical Computing I
STAT-3102(3)	Applied Multivariate Methods
STAT-3103(3)	Applied Regression Analysis
STAT-3104(3)	Analysis of Variance and Covariance
STAT-3105(3)	Time Series and Forecasting
STAT-3302(3)	Survey Sampling II
STAT/MATH-3412(3)	Introduction to Operations Research
STAT-3501(3)	Simulation
STAT/MATH-3612(3)	Mathematical Statistics II
STAT-3904(3)	Statistical Computing II
STAT-4102(3)	Survival Analysis
STAT-4103(3)	Statistical Learning
STAT-4202(3)	Statistical Inference
STAT-4401(3)	Probability Theory
STAT-4501(3)	Spatial Statistics
STAT-4601(3)	Statistical Design of Experiments

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**