MATHEMATICAL SCIENCE (MSCI)

Department of Mathematics and Statistics, College of Engineering and Physical Sciences

B.A. Major Requirements (Honours)

This is a major within the degree: Bachelor of Arts (calendar.uoguelph.ca/undergraduate-calendar/degree-programs/bachelor-arts-ba/).

Knowledge of Mathematics and Statistics is crucial for understanding our world. This unique program provides a core of both mathematics and statistics with a choice of a Mathematics stream or a Statistics stream. This major also requires the completion of an area of emphasis as listed. Students are encouraged to speak with a Program Counsellor when choosing courses for the selected stream and area of emphasis.

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. A total of 20.00 credits is required to complete the Major which includes at least 10.00 credits in Mathematics & Statistics, 0.50 credits in Computing and Information Science, and an additional 2.50 credits in an area of emphasis. Of the total credits required, students are required to complete 2.00 Mathematics and/or Statistics credits at the 4000 level and an additional 3.00 Mathematics and/or Statistics credits must be at the 3000 or 4000 level.

Recommended Program Sequence

Code	Title	Credits
Semester 1		
MATH*1160	Linear Algebra I	0.50
MATH*1200	Calculus I [1]	0.50
1.50 credits selected from the College of Arts and the College of Social and Applied Human Sciences [2]		1.50
Semester 2		
MATH*1210	Calculus II [3]	0.50
STAT*2040	Statistics I	0.50
1.50 electives [4]		1.50
Semester 3		
CIS*1300	Programming [5]	0.50
or CIS*1500	Introduction to Programming	
MATH*2200	Advanced Calculus I	0.50
STAT*3100	Introductory Mathematical Statistics I	0.50
1.00 electives or restricted electives		1.00
Semester 4		
MATH*2130	Numerical Methods	0.50
STAT*2050	Statistics II	0.50
1.50 electives or restricted electives [6]		1.50
Semester 5		
2.50 electives or restricted electives		2.50
Semester 6		
2.50 electives or restricted electives		2.50
Semester 7		
2.50 electives or restricted electives		2.50
Semester 8		
MATH*4440	Case Studies in Mathematics and Statistics	0.50
2.00 electives or restricted electives		2.00

[1]

MATH*1080 Elements of Calculus I or IPS*1500 Integrated Mathematics and Physics I can be taken in place of MATH*1200 Calculus I

[2]

These courses should be chosen from the list of Semester 1 requirements as listed in the Program Regulations for the BA.

[3]

MATH*1090 Elements of Calculus II or IPS*1510 Integrated Mathematics and Physics II can be taken in place of MATH*1210 Calculus II

[4]

Students are reminded that they must meet the BA distribution requirements of 1.50 credits in the humanities and 1.50 credits in the social sciences. PHIL*2110 Formal Logic is recommended.

[5]

Students wishing to pursue the Computer Science Area of Emphasis must take CIS*1300 Programming.

[6]

CIS*2500 Intermediate Programming is recommended

Students are required to complete 5.50 credits from either the Mathematics Stream or the Statistics Stream as follows:

Mathematics Stream

Code	Title	Credits
MATH*2000	Proofs, Sets, and Numbers	0.50
MATH*2210	Advanced Calculus II	0.50
MATH*2270	Applied Differential Equations	0.50
MATH*3160	Linear Algebra II	0.50
MATH*3200	Real Analysis	0.50
3.00 additional credits in MATH or STAT at 3000 level or above of which at least 1.50 credits must be MATH at the 4000 level		3.00

Statistics Stream

Code	Title	Credits
STAT*3110	Introductory Mathematical Statistics II	0.50
STAT*3240	Applied Regression Analysis	0.50
0.50 additional credits in MATH at 2000 level or above		0.50
1.00 additional credits in MATH or STAT at 2000 level or above		1.00
3.00 additional credits in MATH or STAT at 3000 level or above of which at least 1.50 credits must be STAT at the 4000 level		3.00

Areas of Emphasis

Students are required to complete 2.50 credits from **one** of the following Areas of Emphasis:

Each Area of Emphasis is 2.50 credits from a single field of study.

Computer Science (CS) [*]
The following credits must be taken:

Code	Title	Credits
CIS*2430	Object Oriented Programming	0.50
CIS*2500	Intermediate Programming	0.50

CIS*2520	Data Structures	0.50
Select at least 1.00 credits from the following:		
CIS*3110	Operating Systems I	0.50
CIS*3190	Software for Legacy Systems	0.50
CIS*3490	The Analysis and Design of Computer Algorithms	0.50
CIS*3530	Data Base Systems and Concepts	0.50

*

Students are reminded that they must meet the BA requirement that at least 7.00 credits must be at the 3000 level of above.

Note: CIS*2750 Software Systems Development and Integration is recommended in addition to the Area of Emphasis requirements for students interested in Computer Science

Economics (ECON) *

The following credits must be taken:

Code	Title	Credits
ECON*1050	Introductory Microeconomics	0.50
ECON*1100	Introductory Macroeconomics	0.50
ECON*2310	Intermediate Microeconomics	0.50
Select at least 1.00 credits from the following:		
ECON*3100	Game Theory	0.50
ECON*3710	Advanced Microeconomics	0.50
ECON*4710	Advanced Topics in Microeconomics	0.50

*

Students are reminded that they must meet the BA requirement that at least 7.00 credits must be at the 3000 level of above.

Individualized (IND) *

It is required that 2.50 credits are taken from humanities and social science electives where 1.00 credits must be at the 3000 level or above.

Students declaring an Individualized Area of Emphasis must have their choice of 2.50 credits approved by an academic advisor.

*

Students are reminded that they must meet the BA requirement that at least 7.00 credits must be at the 3000 level of above.

B.Sc. Major Requirements (Honours)

This is a major within the degree: Bachelor of Science (calendar.uoguelph.ca/undergraduate-calendar/degree-programs/bachelor-science-bsc/)**.**

Knowledge of Mathematics and Statistics is crucial for understanding our world. This unique program provides a core of both mathematics and statistics with a choice of a Mathematics stream or a Statistics stream. This major also requires the completion of an area of emphasis as listed. Students are encouraged to speak with a Program Counsellor when choosing courses for the selected stream and area of emphasis.

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major may wish to consult the Faculty Advisor. A total of 20.00 credits is required to complete the Major which includes at least 10.00 credits in Mathematics & Statistics, 0.50 credits in Computing and Information Science, and an additional 2.50 credits in an area of emphasis.

Recommended Program Sequence

Students lacking Grade 12 or 4U Biology, Chemistry or Physics should follow the revised schedule of study for this major found at: https://www.uoguelph.ca/bsc/revised_SS/.

Code	Title	Credits
Semester 1		
CHEM*1040	General Chemistry I	0.50
MATH*1160	Linear Algebra I	0.50
Select 0.50 credits from the following: [1]		
BIOL*1070	Discovering Biodiversity	0.50
BIOL*1080	Biological Concepts of Health	0.50
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
Select 1.00 credits from the following: [2]		
IPS*1500	Integrated Mathematics and Physics I	1.00
MATH*1080 & PHYS*1080	Elements of Calculus I and Physics for Life Sciences	1.00
MATH*1200 & PHYS*1080	Calculus I and Physics for Life Sciences	1.00
Semester 2		
CHEM*1050	General Chemistry II	0.50
STAT*2040	Statistics I	0.50
Select 0.50 credits from the following: [1]		
BIOL*1070	Discovering Biodiversity	0.50
BIOL*1080	Biological Concepts of Health	0.50
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
Select 1.00 credits from the following: [3]		
IPS*1510	Integrated Mathematics and Physics II	1.00
MATH*1090 & PHYS*1010	Elements of Calculus II and Introductory Electricity and Magnetism	1.00
MATH*1210 & PHYS*1010	Calculus II and Introductory Electricity and Magnetism	1.00
Semester 3		
CIS*1300 or CIS*1500	Programming [4] Introduction to Programming	0.50
MATH*2200	Advanced Calculus I	0.50
STAT*3100	Introductory Mathematical Statistics I	0.50
1.00 electives or restricted electives		1.00
Semester 4		
MATH*2130	Numerical Methods	0.50
STAT*2050	Statistics II	0.50
1.50 electives or restricted electives		1.50
Semester 5		
2.50 electives or restricted electives		2.50
Semester 6		
2.50 electives or restricted electives		2.50
Semester 7		
2.50 electives or restricted electives		2.50
Semester 8		

MATH*4440	Case Studies in Mathematics and Statistics	0.50
2.00 electives or restricted electives		2.00

1

BIOL*1070 Discovering Biodiversity and BIOL*1090 Introduction to Molecular and Cellular Biology are recommended if taking either the BINF or the BBM Area of Emphasis

2

Students entering the major in first year are strongly advised to take IPS*1500 Integrated Mathematics and Physics I or (MATH*1200 Calculus I, PHYS*1080 Physics for Life Sciences). Students declaring the Energy and Mass Transfer, the Electricity and Systems, or the Signal Processing Area of Emphasis should take (MATH*1200 Calculus I, PHYS*1080 Physics for Life Sciences)

3

Students entering the major in first year are strongly advised to take IPS*1510 Integrated Mathematics and Physics II or (MATH*1210 Calculus II, PHYS*1010 Introductory Electricity and Magnetism). Students declaring the Energy and Mass Transfer, the Electricity and Systems, or the Signal Processing Area of Emphasis should take (MATH*1210 Calculus II, PHYS*1010 Introductory Electricity and Magnetism).

4

Students wishing to pursue the Computer Science Area of Emphasis must take CIS*1300 Programming.

Restricted Electives

1. A minimum of 1.00 credits of Liberal Education electives is required. The list of Liberal Education electives for B.Sc. students can be found at: https://www.uoguelph.ca/bsc/
2. 5.50 credits from either the Mathematics Stream or the Statistics Stream as follows:
3. 2.50 credits from an Area of Emphasis

Mathematics Stream

Code	Title	Credits
MATH*2000	Proofs, Sets, and Numbers	0.50
MATH*2210	Advanced Calculus II	0.50
MATH*2270	Applied Differential Equations	0.50
MATH*3160	Linear Algebra II	0.50
MATH*3200	Real Analysis	0.50
3.00 additional credits in MATH or STAT at the 3000 level or above of which at least 1.50 credits must be MATH at the 4000 level		3.00

Statistics and Data Science Stream

Code	Title	Credits
STAT*3110	Introductory Mathematical Statistics II	0.50
STAT*3240	Applied Regression Analysis	0.50
0.50 additional credits in MATH at 2000 level or above		0.50
1.00 additional credits in MATH or STAT at the 2000 level or above		1.00
3.00 additional credits in MATH or STAT at the 3000 level or above of which at least 1.50 credits must be STAT at the 4000 level		3.00

Areas of Emphasis

Students are required to complete one of the following Areas of Emphasis. Each Area of Emphasis is 2.50 credits from a single field of study.

Bioinformatics (BINF)
The following credits must be taken:

Code	Title	Credits
BIOL*2400	Evolution	0.50
BIOL*3020	Population Genetics	0.50
BIOL*3040	Methods in Evolutionary Biology	0.50
BIOL*3300	Applied Bioinformatics	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50

Biomathematical or Biostatistical Modelling (BBM)
The following credits must be taken:

Code	Title	Credits
BIOL*2060	Ecology	0.50
BIOL*2400	Evolution	0.50
BIOL*3060	Populations, Communities and Ecosystems	0.50
BIOL*3130	Conservation Biology	0.50
BIOL*4150	Wildlife Conservation and Management	0.50

Computer Science (CS)
The following credits must be taken:

Code	Title	Credits
CIS*2430	Object Oriented Programming	0.50
CIS*2500	Intermediate Programming	0.50
CIS*2520	Data Structures	0.50
Select at least 1.00 credits from the following:		
CIS*3110	Operating Systems I	0.50
CIS*3190	Software for Legacy Systems	0.50
CIS*3490	The Analysis and Design of Computer Algorithms	0.50
CIS*3530	Data Base Systems and Concepts	0.50

Note: CIS*2750 Software Systems Development and Integration is recommended in addition to the Area of Emphasis requirements for students interested in Computer Science

Economics (ECON)
The following credits must be taken:

Code	Title	Credits
ECON*1050	Introductory Microeconomics	0.50
ECON*1100	Introductory Macroeconomics	0.50
ECON*2310	Intermediate Microeconomics	0.50
Select at least 1.00 credits from the following:		
ECON*3100	Game Theory	0.50
ECON*3710	Advanced Microeconomics	0.50
ECON*4710	Advanced Topics in Microeconomics	0.50

Note: ECON*1050 Introductory Microeconomics and ECON*1100 Introductory Macroeconomics are approved Liberal Education electives for B.Sc. students

Energy and Mass Transfer (EMT)
The following credits must be taken:

Code	Title	Credits
ENGG*1210	Engineering Mechanics I	0.50
ENGG*2230	Fluid Mechanics	0.50
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*3260	Thermodynamics	0.50
ENGG*3430	Heat and Mass Transfer	0.50

Note: No more than 3.00 credits in ENGG courses may be taken.

Electricity and Systems (EAS)
The following credits must be taken:

Code	Title	Credits
ENGG*1210	Engineering Mechanics I	0.50
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2450	Electric Circuits	0.50
Select at least 1.00 credits from the following:		
ENGG*3410	Systems and Control Theory	0.50
ENGG*3450	Electronic Devices	0.50
ENGG*4460	Robotic Systems	0.50

Note: No more than 3.00 credits in ENGG courses may be taken.

Signal Processing (SP)
The following credits must be taken:

Code	Title	Credits
ENGG*1210	Engineering Mechanics I	0.50
ENGG*2400	Engineering Systems Analysis	0.50
ENGG*2450	Electric Circuits	0.50
ENGG*3390	Signal Processing	0.50
ENGG*4660	Medical Image Processing	0.50

Note: No more than 3.00 credits in ENGG courses may be taken.

Individualized (IN)
It is required that 2.50 credits are taken from approved Science electives for B.Sc. students where 1.00 credits must be at the 3000 level or above. Students declaring an Individualized Area of Emphasis must have their choice of 2.50 credits approved by an academic advisor.

Credit Summary
(20.00 Total Credits)

Code	Title	Credits
First year science credits		5.00
Required science courses semesters 3 − 8		3.00
Restricted electives (Stream and Area of Emphasis)		8.00
Liberal Education electives (# 1 in restricted elective list)		1.00
Free electives - any approved elective for B.Sc. students [5]		3.00
Total Credits		**20**

[5]

Could be less if restricted electives do not count as science

Of the total credits required, students are required to complete 16.00 credits in science of which 2.00 credits must be at the 4000 level and an additional 4.00 credits must be at the 3000 or 4000 level.

Minor Requirements (Honours)
This minor cannot be combined with a major or minor in Mathematics, Statistics, or Mathematical Science.
This minor is not open to students registered in the degree: Bachelor of Computing.

A total of 5.00 credits is required to complete the Minor, including:

Code	Title	Credits
CIS*1300	Programming [1]	0.50
or CIS*1500	Introduction to Programming	
MATH*1200	Calculus I [2]	0.50
or MATH*1080	Elements of Calculus I	
MATH*1210	Calculus II [2]	0.50
or MATH*1090	Elements of Calculus II	
MATH*1160	Linear Algebra I	0.50
STAT*2040	Statistics I	0.50
1.50 additional credits in MATH, STAT, or CIS at the 2000 level or above [3]		1.50
1.00 additional credits in MATH, STAT, or CIS at the 3000 level or above		1.00

[1]

CIS*1300 is recommended for those wishing to take further CIS courses.

[2]

IPS*1500 Integrated Mathematics and Physics I can count toward this 0.50 credit.

[3]

CIS*2050 cannot be counted towards these credits.