

(For students admitted in 2017-18 under the 4-year degree)

BSc in Mathematics

In addition to the requirements of their major programs, students are required to complete the University and School requirements for graduation. For details please refer to the respective sections on this website.

Some courses used to fulfill Major and/or School Requirements can also fulfill University Common Core Requirements. Students may reuse a maximum of 9 credits of these courses to count towards Common Core Requirements.

Major Requirements

Students **MUST** take the following courses prior to enrollment into the major

Major Pre-requisite course(s)

			Credit(s) attained
MATH		Note: [(MATH 1012 <u>OR</u> MATH 1013 <u>OR</u> MATH 1023) <u>AND</u> (MATH 1014 <u>OR</u> MATH 1024)] <u>OR</u> [MATH 1020] (Students following IRE track can only use MATH 1023 and MATH 1024 to fulfill the requirement)	4-7
MATH	1012	Calculus IA	4
MATH	1013	Calculus IB	3
MATH	1014	Calculus II	3
MATH	1020	Accelerated Calculus	4
MATH	1023	Honors Calculus I	3
MATH	1024	Honors Calculus II	3

Required Course(s)

			Credit(s) attained
MATH	2023	Multivariable Calculus	4
MATH		Note: MATH 2033 <u>OR</u> MATH 2043 [Students following IRE Track or Pure Mathematics (Advanced) Track can only use MATH 2043 to fulfill the requirement.]	4
MATH	2033	Mathematical Analysis	4
MATH	2043	Honors Mathematical Analysis	4
MATH		Note: MATH 2121 <u>OR</u> MATH 2131 [Students following IRE Track or Pure Mathematics (Advanced) Track can only use MATH 2131 to fulfill the requirement.]	4
MATH	2121	Linear Algebra	4
MATH	2131	Honors in Linear and Abstract Algebra I	4

MATH		Note: MATH 3033 <u>OR</u> MATH 3043 [Students following IRE Track or Pure Mathematics (Advanced) Track can only use MATH 3043 to fulfill the requirement.]	4
MATH	3033	Real Analysis	4
MATH	3043	Honors Real Analysis	4
COMP		Note: COMP 1021 <u>OR</u> COMP 1022P <u>OR</u> COMP 1022Q	3
COMP	1021	Introduction to Computer Science	3
COMP	1022P	Introduction to Computing with Java	3
COMP	1022Q	Introduction to Computing with Excel VBA	3
LANG	3011	English for Mathematics	3

Track Study

Students should follow one of the tracks and complete all requirements as specified

Applied Mathematics Track

Required Course(s)

			Credit(s) attained
MATH	2352	Differential Equations	4
MATH	2411	Applied Statistics	4
MATH	3312	Numerical Analysis	3
MATH		Note: MATH 4992 <u>OR</u> MATH 4999	3
MATH	4992	Capstone Project in Applied Mathematics	3
MATH	4999	Independent Capstone Project	3

Elective Course(s)

			Minimum credit(s) required
MATH		MATH Depth Electives (4 courses from the specified elective list)	12
MATH	2421	Probability	4
MATH	2431	Honors Probability	4
MATH	3322	Matrix Computation	3
MATH	3332	Data Analytic Tools	3
MATH	3425	Stochastic Modeling	3
MATH	4023	Complex Analysis	3
MATH	4051	Theory of Ordinary Differential Equations	3
MATH	4052	Partial Differential Equations	3
MATH	4321	Game Theory	3
MATH	4326	Introduction to Fluid Dynamics	3
MATH	4333	Mathematical Biology	3
MATH	4335	Introduction to Optimization	3
MATH	4336	Introduction to Mathematics of Image Processing	3
MATH	4351	Numerical Solutions of Partial Differential Equations	3

MATH	4511	Quantitative Methods for Fixed Income Derivatives	3
MATH	4512	Fundamentals of Mathematical Finance	3
MATH	4823	Special Topics in Applied Mathematics	1-4

Computer Science Track

Required Course(s)

			Credit(s) attained
MATH	2343	Discrete Structures	4
MATH	3121	Abstract Algebra	3
MATH		Note: MATH 4991 <u>OR</u> MATH 4992 <u>OR</u> MATH 4999	3
MATH	4991	Capstone Project in Pure Mathematics	3
MATH	4992	Capstone Project in Applied Mathematics	3
MATH	4999	Independent Capstone Project	3
COMP		Note: (COMP 2011 <u>AND</u> COMP 2012) <u>OR</u> COMP 2012H	5-8
COMP	2011	Introduction to Object-oriented Programming	4
COMP	2012	Object-Oriented Programming and Data Structures	4
COMP	2012H	Honors Object-Oriented Programming and Data Structures	5
COMP	2611	Computer Organization	4
COMP		Note: COMP 3711 <u>OR</u> COMP 3711H	3-4
COMP	3711	Design and Analysis of Algorithms	3
COMP	3711H	Honors Design and Analysis of Algorithms	4

Elective Course(s)

			Minimum credit(s) required
MATH		MATH 3000-level or above Elective (Any 1 course of the subject and level as specified)	3
MATH		MATH Electives (2 courses from the specified elective list)	6
MATH	2411	Applied Statistics	4
MATH	2421	Probability	4
MATH	2431	Honors Probability	4
MATH	3312	Numerical Analysis	3
MATH	3322	Matrix Computation	3
MATH	3332	Data Analytic Tools	3
MATH	3343	Combinatorial Analysis	3
MATH	4023	Complex Analysis	3
MATH	4141	Number Theory and Applications	3
MATH	4223	Differential Geometry	3
MATH	4321	Game Theory	3
COMP		COMP 4000-level or above Elective (Any 1 course of the subject and level as specified)	3

COMP		(For students opting COMP 2012H only) COMP 2000-level or above Elective (Any 1 course of the subject and level as specified. Students opting COMP 2011 <u>AND</u> COMP 2012 do not need to fulfill this requirement.)	0-3
COMP		COMP Elective (1 course from the specified elective list)	3
COMP	3031	Principles of Programming Languages	3
COMP	3111	Software Engineering	4
COMP	3111H	Honors Software Engineering	4
COMP	3211	Fundamentals of Artificial Intelligence	3
COMP	3311	Database Management Systems	3
COMP	3511	Operating Systems	3

General Mathematics Track

Required Course(s)

			Credit(s) attained
MATH		Note: MATH 4991 <u>OR</u> MATH 4992 <u>OR</u> MATH 4993 <u>OR</u> MATH 4999	3
MATH	4991	Capstone Project in Pure Mathematics	3
MATH	4992	Capstone Project in Applied Mathematics	3
MATH	4993	Capstone Project in Statistics	3
MATH	4999	Independent Capstone Project	3

Elective Course(s)

			Minimum credit(s) required
MATH		MATH 2000-level or above Electives (Any 3 courses of the subject and level as specified)	9
MATH		MATH 3000-level or above Electives (Any 2 courses of the subject and level as specified)	6
MATH		MATH 4000-level or above Electives (Any 2 courses of the subject and level as specified)	6

International Research Enrichment Track

Students in the IRE Track should also take MATH 1023, MATH 1024, MATH 2043, MATH 2131 and MATH 3043 as specified in the major requirements.

Required Course(s)

			Credit(s) attained
MATH	4981-4982	Independent Study	1-3
SCIE	3500	IRE Research Project I	3
SCIE	4500	IRE Research Project II	3

Other(s)

23-32

With approval by the program office, students should follow the curriculum of one of the following Mathematics Tracks: Pure Mathematics (Advanced) Track, Applied Mathematics Track, or Statistics and Financial Mathematics Track, and complete all of its requirements excluding the capstone project requirement.

Mathematics and Physics Track

Required Course(s)

			Credit(s) attained
MATH	2352	Differential Equations	4
MATH	3312	Numerical Analysis	3
MATH	4023	Complex Analysis	3
MATH	4052	Partial Differential Equations	3
MATH		Note: MATH 4991 <u>OR</u> MATH 4992 <u>OR</u> MATH 4999	3
MATH	4991	Capstone Project in Pure Mathematics	3
MATH	4992	Capstone Project in Applied Mathematics	3
MATH	4999	Independent Capstone Project	3
PHYS		Note: PHYS 1111 <u>OR</u> PHYS 1112 <u>OR</u> PHYS 1312	3
PHYS	1111	General Physics I	3
PHYS	1112	General Physics I with Calculus	3
PHYS	1312	Honors General Physics I	3
PHYS	1113	Laboratory for General Physics I	1
PHYS		Note: PHYS 1114 <u>OR</u> PHYS 1314	3
PHYS	1114	General Physics II	3
PHYS	1314	Honors General Physics II	3
PHYS	1115	Laboratory for General Physics II	1
PHYS	2022	Modern Physics	3
PHYS	2023	Modern Physics Laboratory	1
PHYS	3032	Classical Mechanics	3
PHYS		Note: PHYS 3033 <u>OR</u> PHYS 3053	3-4
PHYS	3033	Electricity and Magnetism I	3
PHYS	3053	Honors Electricity and Magnetism I	4
PHYS		Note: PHYS 3034 <u>OR</u> PHYS 4051 <u>OR</u> PHYS 4052	3
PHYS	3034	Electricity and Magnetism II	3
PHYS	4051	Quantum Mechanics II	3
PHYS	4052	Introductory Solid State Physics	3
PHYS		Note: PHYS 3036 <u>OR</u> PHYS 3037	3-4
PHYS	3036	Quantum Mechanics I	3
PHYS	3037	Honors Quantum Mechanics I	4

PHYS	4050	Thermodynamics and Statistical Physics	3
<i>Elective Course(s)</i>			Minimum credit(s) required
MATH/PHYS		MATH/PHYS 3000-level or above Elective (Any 1 course of the subject and level as specified)	3

Pure Mathematics (Advanced) Track

Students in the Pure Mathematics (Advanced) Track should also take MATH 2043, MATH 2131, and MATH 3043 as specified in the major requirements.

<i>Required Course(s)</i>			Credit(s) attained
MATH	3131	Honors in Linear and Abstract Algebra II	4
MATH	4225	Topology	3
MATH		Note: MATH 4991 <u>OR</u> MATH 4999	3
MATH	4991	Capstone Project in Pure Mathematics	3
MATH	4999	Independent Capstone Project	3
<i>Elective Course(s)</i>			Minimum credit(s) required
MATH		MATH Depth Electives (4 courses from the specified elective list, of which at least 1 course from each area in Algebra / Analysis / Geometry)	12
Algebra			
MATH	4141	Number Theory and Applications	3
MATH	4151	Introduction to Lie Groups	3
Analysis			
MATH	4023	Complex Analysis	3
MATH	4051	Theory of Ordinary Differential Equations	3
MATH	4052	Partial Differential Equations	3
Geometry			
MATH	4033	Calculus on Manifolds	3
MATH	4221	Euclidean and Non-Euclidean Geometries	3
MATH	4223	Differential Geometry	3
MATH		MATH 3000-level or above Elective (Any 1 course of the subject and level as specified)	3
MATH		Applied Mathematics or Statistics Elective (1 course from the specified elective list)	3
MATH	2343	Discrete Structures	4

MATH	2352	Differential Equations	4
MATH	2411	Applied Statistics	4
MATH	3312	Numerical Analysis	3
MATH	3343	Combinatorial Analysis	3
MATH	4321	Game Theory	3
MATH	4326	Introduction to Fluid Dynamics	3

Pure Mathematics Track

Required Course(s)

			Credit(s) attained
MATH	3121	Abstract Algebra	3
MATH	4225	Topology	3
MATH		Note: MATH 4991 <u>OR</u> MATH 4999	3
	MATH 4991	Capstone Project in Pure Mathematics	3
	MATH 4999	Independent Capstone Project	3

Elective Course(s)

			Minimum credit(s) required
MATH		MATH 2000-level or above Electives (Any 2 courses of the subject and level as specified)	6
MATH		Applied Mathematics or Statistics Elective (1 course from the specified elective list)	3
	MATH 2343	Discrete Structures	4
	MATH 2352	Differential Equations	4
	MATH 2411	Applied Statistics	4
	MATH 3312	Numerical Analysis	3
	MATH 3343	Combinatorial Analysis	3
	MATH 4321	Game Theory	3
	MATH 4326	Introduction to Fluid Dynamics	3
MATH		Analysis Depth Elective (1 course from the specified elective list)	3
	MATH 4023	Complex Analysis	3
	MATH 4051	Theory of Ordinary Differential Equations	3
	MATH 4052	Partial Differential Equations	3
MATH		Geometry Depth Elective (1 course from the specified elective list)	3
	MATH 4033	Calculus on Manifolds	3
	MATH 4221	Euclidean and Non-Euclidean Geometries	3
	MATH 4223	Differential Geometry	3
MATH		Algebra Depth Elective (1 course from the specified elective list)	3
	MATH 4141	Number Theory and Applications	3
	MATH 4151	Introduction to Lie Groups	3

Statistics and Financial Mathematics Track

Required Course(s)

			Credit(s) attained
MATH	2411	Applied Statistics	4
MATH		Note: MATH 2421 <u>OR</u> MATH 2431	4
	MATH 2421	Probability	4
	MATH 2431	Honors Probability	4
MATH	3423	Statistical Inference	3
MATH	3424	Regression Analysis	3
MATH	4511	Quantitative Methods for Fixed Income Derivatives	3
MATH	4512	Fundamentals of Mathematical Finance	3
MATH		Note: MATH 4993 <u>OR</u> MATH 4999	3
	MATH 4993	Capstone Project in Statistics	3
	MATH 4999	Independent Capstone Project	3
FINA	2203	Fundamentals of Business Finance	3

Elective Course(s)

			Minimum credit(s) required
MATH		Pure or Applied Mathematics Elective (1 course from the specified elective list)	3
	MATH 2352	Differential Equations	4
	MATH 3312	Numerical Analysis	3
	MATH 3343	Combinatorial Analysis	3
	MATH 4023	Complex Analysis	3
	MATH 4052	Partial Differential Equations	3
MATH		MATH Depth Electives (1 course from the specified elective list. Students may use MATH 4424 to count towards either, but not both, the MATH Depth Elective or the Statistics or Financial Mathematics Elective requirement.)	3
	MATH 3425	Stochastic Modeling	3
	MATH 3426	Sampling	3
	MATH 4423	Nonparametric Statistics	3
	MATH 4424	Multivariate Analysis	3
	MATH 4425	Introductory Time Series	3
	MATH 4426	Survival Analysis	3
	MATH 4428	Bayesian Analysis and Credibility Theory	3
MATH/RMBI		Statistics or Financial Mathematics Elective (1 course from the specified elective list. Students may use MATH 4424 to count towards either, but not both, the MATH Depth Elective or the Statistics or Financial Mathematics Elective requirement.)	3
	MATH 4424	Multivariate Analysis	3

RMBl

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Quantitative Methods for Risk Management

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