(For students admitted in 2021-22 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.

Students may use no more than 6 credits earned from courses offered in self-paced online delivery mode to satisfy the graduation requirements of a degree program. This 6-credit limit does not apply to credits obtained through the credit transfer procedures of the University.

For students graduating with an additional major, they must take all the requirements specified for that major, within which they must complete at least 20 single-counted credits. These 20 credits cannot be used to fulfill any other requirements for graduation except for the 120-credit degree requirement.

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 OR MATH 1013 OR MATH 1023) AND (MATH 1014 OR MATH 1024)] OR [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 OR 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 OR 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 OR 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
LANG			Note: LANG 3021 OR LANG 3026 (Students following IRE Track should take LANG 3026 to fulfill the requirement.)	3
LANG	3021		Science Communication in English (Mathematics)	3
LANG	3026		Science Communication in English for Research Students (Mathematics and Physics)	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 OR 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	2001**		Foundation of Mathematics	2
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	4343	Introduction to Graph Theory	4
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 OR MATH 4992 OR 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 AND COMP 2012) OR COMP 2012H	5-8
COMP	2011	Programming with C++	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 OR 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	2001**	Foundation of Mathematics	2
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
MATH	4343	Introduction to Graph Theory		4
MATH	4632	Machine Learning with Structured Data		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 AND 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 OR MATH 4992 OR MATH 4993 OR 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 2001, MATH 2043, MATH 2131 and MATH 3043 as specified in the major requirements.

Required Course(s)

			Credit(s) attained
SCIE	3500	IRE Research Project I	3
SCIE	4500	IRE Research Project II	3

Other(s)

		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. For students approved to follow the Applied Mathematics Track or the Statistics and Financial Mathematics Track, they must choose MATH 2431 which is listed in the Track Requirements; while for those who follow the Pure Mathematics (Advanced) Track, they should take MATH 2431 as an additional required course.	26-28

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 OR MATH 4992 OR 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 OR PHYS 1112 OR 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 OR 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 OR PHYS 3053	3-4
PHYS	3033	Electricity and Magnetism I	3
PHYS	3053	Honors Electricity and Magnetism I	4
PHYS		Note: PHYS 3034 OR PHYS 4051 OR 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 OR PHYS 3037	3-4
PHYS	3036	Quantum Mechanics I	3
PHYS	3037	Honors Quantum Mechanics I	4
PHYS	4050	Thermodynamics and Statistical Physics	3

Elective Course(s)

			Minimum credit(s) required
MATH/PHYS		Students may choose the following courses to fulfill the requirement	5
MATH	2001**	Foundation of Mathematics	2
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.

Required Course(s)

			Credit(s) attained
MATH	2001**	Foundation of Mathematics	2
MATH	3131	Honors in Linear and Abstract Algebra II	4
MATH	4225	Topology	3
MATH		Note: MATH 4991 OR 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 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
MATH	4343	Introduction to Graph Theory	4

Pure Mathematics Track

Required Course(s)

			Credit(s) attained
MATH	2001**	Foundation of Mathematics	2
MATH	3121	Abstract Algebra	3
MATH	4225	Topology	3
MATH		Note: MATH 4991 OR MATH 4999	3
MATH	4991	Capstone Project in Pure Mathematics	3

MATH	4999	Independent Capstone Project		3

Elective Course(s) <div style="text-align:right">**Minimum credit(s) required**</div>

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	4343	Introduction to Graph Theory	4
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) <div style="text-align:right">**Credit(s) attained**</div>

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		Note: MATH 4424 OR MATH 4425	3
MATH	4424	Multivariate Analysis	3
MATH	4425	Introductory Time Series	3
MATH	4511	Quantitative Methods for Fixed Income Derivatives	3
MATH	4512	Fundamentals of Mathematical Finance	3
MATH		Note: MATH 4993 OR 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	2001**	Foundation of Mathematics	2
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 (2 courses from the specified elective list. Courses taken as Required Courses may not be reused to count towards this elective requirement.)	6
MATH	3425	Stochastic Modeling	3
MATH	3426	Sampling	3
MATH	3427	Bayesian Statistics	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	4432	Statistical Machine Learning	3
MATH	4513	Life Contingencies Models and Insurance Risk	3
MATH	4514	Financial Economics in Actuarial Science	3

**Remarks on course(s):*
- MATH 2001:   This is a new course to take effect in Fall, 2022-23.