MATHEMATICS/APPLIED STATISTICS (BS/MS)

The Accelerated Bachelor's Master's program allows undergraduate students to receive their Master's Degree in a total of five years. Students apply in their junior year and must complete all requirements for the undergraduate and graduate programs. They are able to finish the program in only one additional year by double counting up to 9 credits in their senior year towards both their Undergraduate Degree and their Master's Degree.

Related Programs

Major

- Statistics (BS) (https://catalog.luc.edu/undergraduate/arts-sciences/mathematics-statistics/statistics-bs/)

Combined

- Mathematics (BS/MS) (https://catalog.luc.edu/undergraduate/accelerated-bachelors-masters-program/mathematics-bs-ms/)
- Mathematics - Education Track/Applied Statistics (BS/MS) (https://catalog.luc.edu/undergraduate/accelerated-bachelors-masters-program/mathematics-education-track-bs-applied-statistics-ms/)

Curriculum

AP Credit Policies (https://catalog.luc.edu/undergraduate/arts-sciences/mathematics-statistics/#policiestext)

Requirements

Code	Title	Hours
BS Requirements		
Required Courses		
Foundational Requirements		
MATH 161	Calculus I	4
MATH 162	Calculus II	4
MATH 263	Multivariable Calculus	4
MATH 264	Ordinary Differential Equations	3
MATH 201	Introduction to Discrete Mathematics & Number Theory	3
MATH 212	Linear Algebra	3
STAT 203	Introduction to Probability & Statistics	3
or MATH 304 / STAT 304	Introduction to Probability	
MATH 215	Object-Oriented Programming with Mathematics	3
or COMP 170	Introduction to Object-Oriented Programming	
One year of Modern Algebra:		
MATH 313	Abstract Algebra	3
MATH 314	Advanced Topics Abstract Algebra	3
or MATH 315	Advanced Topics in Linear Algebra	
One year of Analysis:		
MATH 351	Introduction to Real Analysis I	3
MATH 352	Introduction to Real Analysis II	3
or MATH 353	Introduction to Complex Analysis	
Two 3-credit upper division (300-level) electives in mathematics. [1]		6
Science Requirements		
Select two of the following:		6
ANTH 101	Human Origins	
BIOL 101	General Biology I	
BIOL 102	General Biology II	
CHEM 160	Chemical Structure and Properties	
CHEM 180	Chemical Reactivity I	
ENVS 101	The Scientific Basis of Environmental Issues	
PHYS 121	College Physics I with Calculus Lecture/ Discussion	
PHYS 122	College Physics II with Calculus Lecture/ Discussion	
MS Requirements		
STAT 401	Introduction to Applied Statistics Using R	1
STAT 403	SAS Program & Applied Statistics	3
STAT 404	Probability & Statistics I	3
STAT 405	Probability & Statistics II	3
STAT 407	Statistical Design	3
STAT 408	Applied Regression Analysis	3
STAT 495	Statistical Consulting Capstone	2
Select Four (4) Elective Courses		*12*
STAT 406	Stochastic Processes	
STAT 410	Categorical Data Analysis	
STAT 411	Applied Survival Analysis	
STAT 421	Math Modeling & Simulation	
STAT 426	Advanced Statistical Inference	
STAT 436	Topics in Biostatistics	
STAT 438	Introduction to Predictive Analytics	
STAT 444	Longitudinal Data Analysis and Mixed Modeling	
STAT 451	Applied Nonparametric Methods	
STAT 488	Topics in Statistics	
STAT 498	Independent Study Statistics	
Total Hours		**75**

The BS degree has waivers for both Quantitative and Scientific core.

MS Specializations

Our flexible program allows students to focus on their interests by choosing a specialization. Possibilities include:

Specialization	Description
Biostatistics	The Biostatistics specialization covers non- and pre-clinical statistical methods, bioassay, statistical genetics, clinical trials, and bioinformatics.
Environmental Statistics	The Environmental Statistics specialization addresses Geographic Information Systems (GIS), spatial statistics, and environmetrics.
General Applied Statistics	The specialization in General Applied Statistics includes non-medical applications such as actuarial, commercial, data-mining, industrial, marketing, and national defense.
Predictive Analytics/ Modeling	The Predictive Modeling specialization focuses on big data analytics and modeling.

Suggested Sequence of Courses

Note: This is only one possibility. Among other things, depending on initial math placement, which can range from MATH 100 to MATH 263, the schedule will look very different. Especially for students starting at MATH 161 or above, there is a lot of space to pursue a minor or even a second major.

Course	Title	Hours
Year 1		
Fall		
MATH 161	Calculus I	4
Science Requirement		3
	Hours	**7**
Spring		
MATH 162	Calculus II	4
MATH 201	Introduction to Discrete Mathematics & Number Theory	3
Science Requirement		3
	Hours	**10**
Year 2		
Fall		
MATH 263	Multivariable Calculus	4
MATH 215 or COMP 170	Object-Oriented Programming with Mathematics or Introduction to Object-Oriented Programming	3
	Hours	**7**
Spring		
MATH 212	Linear Algebra	3
MATH 264	Ordinary Differential Equations	3
	Hours	**6**
Year 3		
Fall		
MATH 313	Abstract Algebra	3
STAT 203 or MATH 304	Introduction to Probability & Statistics or Introduction to Probability	3
	Hours	**6**
Spring		
MATH 314 or MATH 315	Advanced Topics Abstract Algebra or Advanced Topics in Linear Algebra	3
300-level Major Elective		3
	Hours	**6**
Year 4		
Fall		
MATH 351	Introduction to Real Analysis I	3
400-level Major Elective		3
	Hours	**6**
Spring		
MATH 352 or MATH 353	Introduction to Real Analysis II or Introduction to Complex Analysis	3
400-level math class		
	Hours	**3**
Year 5		
Students take remainder of MS courses in consultation with the Graduate Program Director.		24
	Hours	**24**
	Total Hours	**75**

Guidelines for Accelerated Bachelor's/ Master's Programs

Terms

- Accelerated Bachelor's/Master's programs: In this type of program, students share limited credits between their undergraduate and graduate degrees to facilitate completion of both degrees.
- Shared credits: Graduate level credit hours taken during the undergraduate program and then applied towards graduate program requirements will be referred to as shared credits.

Admission Requirements

Accelerated Bachelor's/Master's programs are designed to enhance opportunities for advanced training for Loyola's undergraduates. Admission to these programs must be competitive and will depend upon a positive review of credentials by the program's admissions committee. Accordingly, the admission requirements for these programs may be higher than those required if the master's degree were pursued entirely after the receipt of a bachelor's degree. That is, programs may choose to have more stringent admissions requirements in addition to those minimal requirements below.

Requirements:

- Declared appropriate undergraduate major,
- By the time students begin taking graduate courses as an undergraduate, the student has completed approximately 90 credit hours, or the credit hours required in a program that is accredited by a specialty organization,[1]
- A minimum cumulative GPA for coursework at Loyola that is at or above the program-specific requirements, a minimum major GPA that is at or above the program-specific requirements, and/or appropriate designated coursework for evaluation of student readiness in their discipline.[2]

Students not eligible for the Accelerated Bachelor's/Master's program (e.g., students who have not declared the appropriate undergraduate major) may apply to the master's program through the regular admissions process. Students enrolled in an Accelerated Bachelor's/Master's program who choose not to continue to the master's degree program upon completion of the bachelor's degree will face no consequences.[3]

Ideally, a student will apply for admission (or confirm interest in proceeding towards the graduate degree in opt-out programs) as they approach 90 credit hours. Programs are encouraged to begin advising students early in their major so that they are aware of the program and, if interested, can complete their bachelor's degree requirements in a way that facilitates completion of the program. Once admitted as an undergraduate, Program Directors should ensure that students are enrolled using the plan code associated with the Accelerated Bachelor's/ Master's program. Using the plan code associated with the Accelerated Bachelor's/Master's program will ensure that students may be easily identified as they move through the program. Students will not officially matriculate into the master's degree program and be labeled as a graduate student by the university, with accompanying changes to tuition and Financial Aid (see below), until the undergraduate degree has been

awarded. Once admitted to the graduate program, students must meet the academic standing requirements of their graduate program as they complete the program curriculum.

1 Programs that have specialized accreditation will adhere to the admissions criteria provided by, or approved by, their specialized accreditors.
2 The program will identify appropriate indicators of student readiness for graduate coursework (e.g., high-level performance in 300 level courses). Recognizing differences between how majors are designed, we do not specify a blanket requirement.
3 If students choose not to enroll in the Accelerated Bachelor's/Master's program, they still must complete all of the standard requirements associated with the undergraduate degree (e.g., a capstone).

For more information on Admissions requirements, visit here (https://gpem.luc.edu/portal/admission/?tab=home).

Curriculum

Level and progression of courses. The Accelerated Bachelor's/Master's programs are designed to be competitive and attractive to our most capable students. Students admitted to Accelerated Bachelor's/Master's programs should be capable of meeting graduate level learning outcomes. Following guidance from the Higher Learning Commission, only courses taken at the 400 level or higher (including 300/400 level courses taken at the 400 level) will count toward the graduate program.[1,2] Up to 50% of the total graduate level credit hours, required in the graduate program, may come from 300/400 level courses where the student is enrolled in the 400 level of the course. Further, at least 50% of the credit hours for the graduate program must come from courses that are designed for and restricted to graduate students who have been admitted to a graduate program at Loyola (e.g., enrolled in plan code that indicates the Accelerated Bachelor's/Master's program, typically ending with the letter "D").[3]

In general, graduate level coursework should not be taken prior to admission into the Accelerated Bachelor's/Master's program. Exceptions may be granted for professional programs where curriculum for the Accelerated Bachelor's/Master's program is designed to begin earlier. On the recommendation of the program's Graduate Director, students may take one of their graduate level courses before they are admitted to the Accelerated Bachelors/Master's program if they have advanced abilities in their discipline and course offerings warrant such an exception.[4] Undergraduate degree requirements outside of the major are in no way impacted by admission to an Accelerated Bachelor's/Master's program.[5]

Shared credits. Undergraduate courses (i.e., courses offered at the 300 level or below) cannot be counted as shared credits nor count towards the master's degree. Up to 50% of the total graduate level credit hours, required in the graduate program, may be counted in meeting both the undergraduate and graduate degree requirements. Of those shared credits, students in an Accelerated Bachelor's/Master's program should begin their graduate program with the standard introductory course(s) for the program whenever possible. So that students may progress through the Accelerated Bachelor's/Master's program in a timely manner, undergraduate programs are encouraged to design their curriculum such that a student can complete some required graduate credit hours while completing the undergraduate degree. For instance, some of the graduate curriculum should also satisfy electives for the undergraduate major.

The program's Graduate Director will designate credit hours to be shared through the advising form and master's degree conferral review process. Shared credit hours will not be marked on the undergraduate record as having a special status in the undergraduate program. They will be included in the student's undergraduate earned hours and GPA. Graduate credit hours taken during the undergraduate program will not be included in the graduate GPA calculation.

1 If students wish to transfer credits from another university to Loyola University Chicago, the program's Graduate director will review the relevant syllabus(es) to determine whether it meets the criteria for a 400 level course or higher.
2 Programs with specialized accreditation requirements that allow programs to offer graduate curriculum to undergraduate students will conform to those specialized accreditation requirements.
3 In rare cases, the Graduate Director may authorize enrollment in a 400-level course for a highly qualified and highly motivated undergraduate, ensuring that the undergraduate's exceptional participation in the graduate class will not diminish in any way the experience of the graduate students regularly enrolled.
4 For example, if a particular course is only offered once every 2-3 years, and a student has demonstrated the necessary ability to be successful, the Graduate Director may allow a student to take a graduate level course to be shared prior to the student being formally admitted to the graduate program. See, also, footnote 3.
5 Students should not, for example, attempt to negotiate themselves out of a writing intensive requirement on the basis of admission to a graduate program.

Graduation

Degrees are awarded sequentially. All details of undergraduate commencement are handled in the ordinary way as for all students in the School/College/Institute. Once in the graduate program, students abide by the graduation deadlines set forth by the graduate program. Students in these programs must be continuously enrolled from undergraduate to graduate degree program unless given explicit permission by their program for a gap year or approved leave of absence. In offering the option of an Accelerated Bachelor's/Master's program, the university is making possible the acceleration of a student's graduate degree completion. It should be understood that students may not request deferral of their matriculation into the Master's degree program. If students would like to delay their graduate studies after earning the undergraduate degree, they may apply for admission to the traditional master's degree program. Any application of graduate credit earned while in the undergraduate program is subject to the policies of the graduate degree granting school.

Learning Outcomes

- Students will have wide knowledge of and strong skills in using the methods and tools that form the foundation of math. These include calculus, linear algebra, and differential equations, as well as statistics and computer sciences. [Mathematics]
- Students will acquire analytical and logical skills that form the basis of mathematical thinking and reasoning. These skills will enable problem solving, the abstraction to general principles from specific examples, and the ability to use formal mathematical language. Students will be able to apply these skills in a variety of contexts. [Mathematics]
- Students will be fluent in the traditional mathematical subjects such as abstract algebra and real analysis. They will be able to use the methods and terminology in these field to read and write

formal, logical proofs, and to communicate these both in writing and verbally. [Mathematics]

- Students will understand how different sub-disciplines of mathematics fit together. They will be able to use their knowledge in a variety of modern applications, both within math and in related disciplines such as science, engineering and tech. They will also be able to place these in a historical context. [Mathematics]
- Mastered the art and science of choosing and/or developing the appropriate statistical model(s) for a given dataset-situation, and have mastered the skill of interpreting the chosen model. [Applied Statistics]
- Received sufficient exposure to basic theorems and proofs used in introductory probability and statistical inference. [Applied Statistics]
- Worked with data from application fields such as public/global health, medical, industrial and environmental research. [Applied Statistics]
- Received training to ethically apply statistical training in the real world. [Applied Statistics]
- Obtained hands-on experience and assimilated course material via our 2cr Statistical Consulting capstone/practicum class. [Applied Statistics]
- Sufficiently mastered the course and practicum material to either obtain gainful employment in the field of attend a Ph.D. program [Applied Statistics]