

# MATHEMATICS AND COMPUTER SCIENCE/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

- Mathematics (BS) (<https://catalog.luc.edu/undergraduate/arts-sciences/mathematics-statistics/mathematics-bs/>)
- Mathematics and Computer Science (BS) (<https://catalog.luc.edu/undergraduate/arts-sciences/mathematics-statistics/mathematics-computer-science-bs/>)

### Combined

- Mathematics and Computer Science/Mathematics (BS/MS) (<https://catalog.luc.edu/undergraduate/accelerated-bachelors-masters-program/mathematics-computer-science-mathematics-bs-ms/>)

## Curriculum

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

Code	Title	Hours
<b>BS Requirements</b>		
<i>Math Requirements</i>		
MATH 161	Calculus I	4
MATH 162	Calculus II	4
MATH 263	Multivariable Calculus	4
MATH 201	Introduction to Discrete Mathematics & Number Theory	3
MATH 212	Linear Algebra	3
MATH 264	Ordinary Differential Equations	3
MATH 313	Abstract Algebra	3
MATH 351	Introduction to Real Analysis I	3
STAT 203	Introduction to Probability & Statistics	3
	or MATH 304 / Introduction to Probability	
	STAT 304	
Select two electives in mathematics from the following:		6
MATH 309	Numerical Methods	
MATH 314	Advanced Topics Abstract Algebra	
MATH 315	Advanced Topics in Linear Algebra	
MATH 352	Introduction to Real Analysis II	
MATH 353	Introduction to Complex Analysis	
<i>Computer Science Requirements</i>		
COMP 141	Introduction to Computing Tools and Techniques	3
COMP 170	Introduction to Object-Oriented Programming	3

COMP 264	Introduction to Computer Systems	3
COMP 271	Data Structures I	3
COMP 272	Data Structures II	3
COMP 363	Design and Analysis Computer Algorithms	3
Select two 3-credit electives in Computer Science from the following:		6
BIOL 388	Bioinformatics	
Any 300-level COMP course		
MATH 328	Algebraic Coding Theory	
MATH 331	Cryptography	
STAT 321	Computational Aspects of Modeling and Simulation	

### 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
<i>Select Four (4) Elective Courses</i>		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	
<b>Total Hours</b>		<b>90</b>

The BS degree has a waiver for the Quantitative core.

## 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,<sup>1</sup>
- 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.<sup>2</sup>

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.<sup>3</sup>

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.

- <sup>1</sup> Programs that have specialized accreditation will adhere to the admissions criteria provided by, or approved by, their specialized accreditors.
- <sup>2</sup> 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.
- <sup>3</sup> 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.<sup>1,2</sup> 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").<sup>3</sup>

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 Bachelor's/Master's program if they have advanced abilities in their discipline and course offerings warrant such an exception.<sup>4</sup> Undergraduate degree requirements outside of the major are in no way impacted by admission to an Accelerated Bachelor's/Master's program.<sup>5</sup>

*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.

- <sup>1</sup> 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.
- <sup>2</sup> Programs with specialized accreditation requirements that allow programs to offer graduate curriculum to undergraduate students will conform to those specialized accreditation requirements.
- <sup>3</sup> 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.
- <sup>4</sup> 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.
- <sup>5</sup> 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 the mathematics and computer science disciplines. These include calculus, linear algebra, and differential equations, statistics, modern computer programming. [Mathematics & Computer Science]
- Students will acquire analytical and logical skills in the mathematical and computer sciences. These skills will enable problem solving, the abstraction to general principles from specific examples as well as the ability to design, implement, and evaluate a computational system to meet a given set of requirements. [Mathematics & Computer Science]
- Students will understand traditional mathematical subjects such as abstract algebra and real analysis. They will be able to use the methods and terminology in these fields to read and write formal, logical proofs, and to communicate these both in writing and verbally. [Mathematics & Computer Science]
- Students will understand the design and analysis of computer algorithms. Students will be exposed to a variety of modern topics which heavily rely on these algorithms and other knowledge of computer science. [Mathematics & Computer Science]
- Students will understand how different sub-disciplines of mathematics and different topics learned in computer science fit together. They will be able to use their knowledge in a variety of modern applications. [Mathematics & Computer Science]
- 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]