MATHEMATICS AND COMPUTER SCIENCE/ MATHEMATICS (BS/MS)

The accelerated BS/MS program gives academically successful Loyola undergraduates the opportunity to pursue the MS degree in Mathematics while completing their BS degree. The B.S. in Mathematics and Computer Science provides students with a strong foundation in both fields. Core courses from the Mathematics and Computer Science curricula will aid students to develop critical thinking and communication skills, as well as a technical and practical understanding of programming and algorithm design. Graduating students will be prepared for any industry jobs requiring scientific computing skills and the ability to analyze, design, and implement algorithms, such as data mining, finance, and risk analysis. This major also prepares students for advanced degrees in computer science, mathematics, and the STEM fields.

There are several advantages to pursuing the BS/MS program. Chief among them are time and cost: by taking graduate courses during their senior year (at the undergraduate tuition rate), students in the BS/MS program save one semester over the usual path to a Master's degree. Additionally, students in the STEM fields holding an MS degree are more competitive for jobs.

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/Applied Statistics (BS/MS) (https://catalog.luc.edu/undergraduate/accelerated-bachelors-masters-program/mathematics-computer-science-bs-applied-statistics-ms/)

Curriculum

The following are required to complete this accelerated bachelor's/master's program:

- Successful completion of the Mathematics and Computer Science BS, within the College of Arts & Sciences.
- Successful completion of the 30-credit Mathematics MS degree with a GPA of 3.0 or higher.

Students in the BS/MS program are permitted to take up to 10 credit hours of 400-level courses that would apply toward their MS program requirements while completing their undergraduate degree. Of these, nine credits may come 400-level courses that have 300-level equivalents that satisfy BS program requirements. The one-credit course MATH 401 should also be taken during the student's undergraduate career. (While it does not fulfill any specific undergraduate program requirement, it does count towards the credit-hours requirement for a degree from the College of Arts & Sciences.)

Code	Title	Hours
BS Requirements		
Math Requirements		
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 / STAT 304	Introduction to Probability	
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	
Computer Science Requirements		
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		
Foundational Course Requirements		
MATH 416	Survey of Algebra	3
MATH 454	Survey of Analysis	3
MATH 404 / STAT 404	Probability & Statistics I [1]	3
or STAT 408	Applied Regression Analysis	
Depth Requirement Courses		
Select one of the following:		3
MATH 414	Algebra II	
MATH 415	Topics in Linear Algebra	
MATH 452	Analysis II	
MATH 453	Complex Analysis	
Select one of the following: [1]		3
MATH 405 / STAT 405	Probability & Statistics II	
STAT 410	Categorical Data Analysis	
COMP 429	Natural Language Processing	

COMP 487	Deep Learning	
DSCI 401	Introduction to Data Science	
Or another course with Graduate Program Director approval		
Additional Requirements		
MATH 401	Introduction to Graduate Study in Mathematics	1
MATH 495	Graduate Practicum in Mathematics	2
Four (4) approved 400-level Electives in Mathematics or Statistics [2]		12
Total Hours		**90**

[1] Students who select MATH 404/STAT 404 in Foundational Courses may opt to take STAT 408 as a Depth Course, and vice versa.

[2] Approved elective courses should be selected with advice of Graduate Program Director to complement student's previous learning and support future plans.

The BS degree has a waiver for the Quantitative core.

Further Information

Interested students should reach out to the Graduate Program Director in their sophomore year (or early junior year) to optimize course selection for their remaining semesters.

Eligibility Requirements

- 3.5 minimum GPA, in major-program coursework: MATH 161, MATH 162, MATH 263, MATH 201, and three courses (9 credits total) chosen from MATH 212 and 300-level math/stat courses
- 3.3 minimum GPA, across all Loyola coursework
- Satisfactory progress towards completion of Loyola's core

Program Policies

- AP Credit Policies (https://catalog.luc.edu/undergraduate/arts-sciences/mathematics-statistics/#policiestext)
- No 300-level courses will apply toward graduate requirements.
- A student with credit for a 300-level MATH/STAT/COMP course that has an equivalent 400-level offering may not take the 400-level course for separate credit.

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 the mathematics and computer science disciplines. These include calculus, linear algebra, and differential equations, statistics, modern computer programming. [BS]
- 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. [BS]
- 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. [BS]
- 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. [BS]
- 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. [BS]
- Graduates will be able to construct mathematical proofs of basic theorems, and to write these proofs clearly using correct grammatical constructs and appropriate mathematical notation [MS]
- Graduates will have seen applications of mathematics to areas across mathematical disciplines and outside of mathematical disciplines [MS]
- Graduates will receive the training sufficient for acceptance into PhD programs or professional schools, or for hire in mathematics related industries [MS]
- Graduates will receive training on how to act responsibly and ethically within the discipline [MS]