

# LOGIC, INFORMATION, & COMPUTATION, BA

Modern mathematical logic began with work by Cantor, Frege, and other mathematicians during the last three decades of the nineteenth century who were concerned with providing a sound basis for the development of mathematical analysis. In the wake of "the crisis in the foundations of mathematics" precipitated by the discovery of various logical paradoxes at the turn of the twentieth century, mathematicians and philosophers such as Hilbert and Russell intensively pursued investigations into the logical foundations of mathematics. Connections between logic and the foundations of mathematics remained an important source for scientific developments in logic through the epochal results of Gödel in 1930 and 1931, which indicated both the scope and limits of the mechanization of mathematical reasoning. The great burst of scientific activity occasioned by Gödel's results led directly to Turing's mathematical characterization of mechanical computation in terms of simple devices, now known as Turing machines. The work of Gödel, Turing, and other logicians during the 1930s laid the scientific foundations for the revolution in computer and information technology that began in the last half of the twentieth century and continues today.

The Logic, Information, and Computation Program offers students the opportunity to engage in a systematic, integrative program of study within the School of Arts and Sciences. Logic remains one of the core disciplines in investigations of information and computation. Indeed, logic is playing a major role in advances in computer security, database technology, networking, and software engineering. Moreover, logic has expanded its role within mathematics beyond foundational studies and now enjoys rich connections with areas as diverse as algebra, analysis, and combinatorics. In light of the current importance of the investigation of computation and information from both a scientific and technological point of view, the Major and Minor in Logic, Information, and Computation will provide students with a strong background to pursue computational aspects of the natural, biological, and social sciences and prepare them for careers in information technology.

The minimum total course units (<https://www.college.upenn.edu/credits-needed-major>) for graduation in this major is 36. Double majors may entail more course units.

**For more information:** <http://logic.sas.upenn.edu/program.html>

For information about the General Education requirements, please visit the College of Arts & Sciences Curriculum (<https://www.college.upenn.edu/curriculum>) page.

Code	Title	Course Units
<b>College General Education Requirements and Free Electives</b>		
Foundational Approaches + Sectors <sup>1</sup> + Free Electives		19
<b>Major Requirements</b>		
<i>Mathematics Requirement</i>		
MATH 104	Calculus, Part I	1
MATH 114	Calculus, Part II	1
MATH 240	Calculus, Part III	1
MATH 370	Algebra	1
or MATH 502	Abstract Algebra	
MATH 371	Algebra	1

or MATH 503 Abstract Algebra

<i>Computer &amp; Info Science Requirement</i>		
CIS 120	Programming Languages and Techniques I	1
CIS 121	Programming Languages and Techniques II	1
CIS 320	Introduction to Algorithms	1
<i>Physics Requirement</i>		
PHYS 150	Principles of Physics I: Mechanics and Wave Motion	1.5
PHYS 151	Principles of Physics II: Electromagnetism and Radiation	1.5
<i>Logic, Info, &amp; Computation Requirement</i>		
LGIC 210/ MATH 340	Applied Mathematics of Information and Computation I	1
LGIC 310/ PHIL 006/ MATH 570	Logic I	1
LGIC 220/ MATH 341	Applied Mathematics of Information and Computation II	1
LGIC 320/ PHIL 412/ MATH 571	Logic II	1
<i>Elective</i>		
Select 1 course unit of Elective <sup>2</sup>		1
<i>Capstone Seminar</i>		
LGIC 499	Topics in Logic	1
Total Course Units		36

<sup>1</sup> You may count no more than one course toward both a Major and a Sector requirement. For Exceptions, check the Policy Statement (<http://www.college.upenn.edu/sectors-policy>).

<sup>2</sup> Check: <http://logic.sas.upenn.edu> for pre-approved courses.

## Honors

Applicants must have an overall GPA of 3.0 and a GPA of 3.5 in the Major. Senior research project required.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2018 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.