Mathematics and Computer Science

The Mathematics and Computer Science graduate programs offer a vital intellectual community that combines cutting edge research with a friendly and supportive atmosphere. We have active research groups in several areas, including collaborations with faculty members from other programs and schools at Emory and with researchers at universities across the world.

We provide four distinct graduate programs: two doctoral programs, in Mathematics and in Computer Science and Informatics, and two Master’s programs, in Mathematics and in Computer Science.

The doctoral program in Mathematics began in the 1960s with the first graduates completing their degrees in 1966. Since then well over 100 Ph.D.s have been granted. Students have undertaken research in a broad range of mathematical areas, many publishing scholarly articles in advance of program completion. The graduate program in Computer Science was inaugurated in 1975 as a combined Computer Science/Mathematics Masters degree. Currently, M.S. and Ph.D. students conduct research in a variety of areas in Computer Science and Informatics.

Research
We have active research groups in several areas. Specific research programs are listed below under Programs of Study. In addition, more details on current activities of each research group can be found on our department website, www.mathcs.emory.edu. The department regularly hosts visiting researchers and seminar speakers in a wide range of areas. Abstracts for upcoming seminars can also be found on the department website.
Programs of Study

Mathematics Ph.D. Program
The Department offers a Ph.D. in Mathematics designed for those with an undergraduate degree in Mathematics. The Ph.D. is suitable for those wishing to pursue careers in academics or industry. Possible areas of research specialization include:

- **Algebra and Number Theory**: Division algebras and the Brauer group, Galois cohomology, real algebraic geometry, algebraic groups, number theory involving elliptic curves, L-functions, and modular forms, computational methods.

- **Analysis and Differential Geometry**: Complex analysis, conformal and quasiconformal mappings, global analysis on manifolds, microlocal analysis, geometric analysis, partial differential equations.

- **Computational Mathematics**: High performance computing, computational fluid dynamics, image processing, inverse problems, numerical analysis (linear algebra, PDEs, optimization), scientific computation.

- **Discrete Mathematics**: Graph theory, random structures, ordered sets, projective planes, theory of computation.

- **Topology**: Low-dimensional geometric topology, combinatorial topology, geometric group theory, hyperbolic geometry.

Students in the Mathematics Ph.D. program can follow either a pure or computational mathematics track, and typically complete the program in 4 to 5 years.

Computer Science and Informatics Ph.D. Program
The department offers a Ph.D. in Computer Science and Informatics. The Ph.D. is suitable for those wishing to pursue careers in academics or industry. The program is a five-year, research-intensive program that combines coursework, hands-on rotation projects, and dissertation research. Possible areas of research specialization include:

- **Data and Information Management**: data mining, privacy and security, information retrieval and web search, natural language processing and text mining, and statistical data analysis and integration in medical, public health, and biological data management domains.

- **Discrete Mathematics and Theoretical Computer Science**: graph theory, theory of computation, approximation algorithms, combinatorial optimization, mathematical programming, geometric algorithms.

- **Distributed and High-Performance Computing**: metacomputing, distributed systems, high-performance computing and collaboration technologies, networking.

- **Scientific Computing**: numerical linear algebra, image processing, iterative methods, optimization, partial differential equations.

Computer Science and Informatics Ph.D. with Biomedical Informatics Concentration
Biomedical Informatics (BMI) is the study of the acquisition, maintenance, retrieval, and application of biomedical knowledge and information to improve patient care, medical education, health and public health sciences research. Students in the Computer Science and Informatics Ph.D. program with an interest in the application of computation to biomedical research questions may elect the BMI concentration, which is jointly administered by departments of Mathematics and Computer Science, Biomedical Informatics, and Biostatistics and Bioinformatics.
Computer Science MS Program
The department offers an MS in Computer Science suited to individuals with an undergraduate degree in computer science or mathematics with computational experience. Those obtaining the degree may pursue careers in industry or enter a Ph.D. program in Computer Science. Students admitted to the MS program may choose among a thesis option, a course-only option, or a project option. Full and partial tuition scholarships are available on a competitive basis.

Computer Science MS with Biostatistics Concentration
The program, jointly offered with the department of Biostatistics and Bioinformatics, is suited to individuals with an undergraduate degree in an appropriate discipline, e.g. mathematics, statistics, computer science, or a natural, physical or social sciences subject. Those obtaining the degree will be exceptionally well-prepared for next-generation careers in industry, government, or public health, or to enter a doctoral program in Informatics, Computer Science, Biostatistics, or Statistics.

Computer Science MS with Computational Science Concentration
This program combines key elements of graduate study in Computer Science augmented with advanced coursework and projects in computationally focused scientific inquiries. The new concentration will train students capable of applying quantitative and computing methods to emerging challenges in the natural and physical sciences.

Faculty
Emory Mathematics and Computer Science has more than 25 regular faculty, as well as several research associates and visiting researchers. Many research projects in the department are funded through grants from the National Science Foundation, the U.S. Department of Energy, the U.S. Department of Defense and the National Institutes of Health. Research produced by our faculty and graduate students is published in the most respected mathematics and computer science journals and proceedings, and each year our faculty are invited to present research lectures at international conferences around the world. A complete list of our faculty members, with links to their teaching and research interests may be found on the department website.

Students
Approximately 65 Ph.D. students are enrolled at any one time, with 10-14 students entering the program each year (5-7 in mathematics and 4-7 in computer science). Students come from all parts of the world; we have 25 students from North America, 16 from Europe, 22 from Asia, and 2 from South America.

Graduates of our programs pursue careers in academia, government, and the private sector. Recent graduates have successfully competed for prestigious postdoctoral positions in the U.S., Europe, and South America, have attained academic positions at a variety of universities, and have been hired by companies such as Standard and Poor’s and Google.

Support for Students
The department offers extensive support programs for graduate students, including the following:

Active research seminars provide students exposure to current developments in a broad spectrum of research fields.

A monthly Graduate Student Seminar exposes first and second year students to ongoing research in our department. Lectures for these seminars are typically at a more basic level than the regular research seminars.

The department provides support for a student professional organization: The Society for Industrial and Applied Mathematics (SIAM) Student Chapter.

The department assists students in finding internship opportunities with financial and software companies, government institutions, and other Emory organizations. Through competitive programs, students have also interned at the Los Alamos National Laboratory and the Lawrence Berkeley National Laboratory.

The department is committed to preparing students for possible academic careers and offers a teaching seminar to prepare graduate students for teaching.
Facilities
The Mathematics and Science Center, designed to be a “green” building, is home to the department. The energy conservation design of the building provides an abundance of windows allowing natural light into most of the classroom and office spaces—including graduate student offices. In addition to offices, classroom and laboratory space, the building houses an astronomy observatory and a planetarium.

Graduate students have access to computers and to our wireless network. Office spaces support a sense of community, and include rooms for socializing, for seminars and colloquia receptions, and for research collaboration.

The department maintains its own shared computing resources and infrastructure, which is administered by the department’s technical staff. Computing resources include shared memory, multi-processor compute servers, Linux clusters, and ample data storage capabilities. In addition, the department maintains a computing laboratory and state-of-the-art audio visual equipment in each classroom.

Questions regarding the program and the application process can be sent to the Director of Graduate Studies or the Graduate Program Coordinator: dgs@mathcs.emory.edu.