SCIENTIFIC COMPUTING (MS)

Department Website (http://cs.nyu.edu)

NYSED: 19386 **HEGIS:** 0799.00 **CIP:** 30.3001

Program Description

The MS in Scientific Computing, offered jointly by the Departments of Mathematics and of Computer Science, provides broad rigorous training in areas of mathematics and computer science related to scientific computing. It aims to prepare people for a technical career in scientific computing or for further study in a field with computing as an essential element.

The program accommodates both full-time and part-time students, with most courses meeting in the evening. Required coursework includes core mathematical and computer science material related to scientific computing. Students choose electives specific to their interest and goals. Specific application areas include mathematical and statistical finance, machine learning/data science, fluid mechanics, finite element methods, and biomedical modeling. The program culminates in a capstone project, which serves to integrate the classroom material.

Admissions

All applicants to the Graduate School of Arts and Science (GSAS) are required to submit the general application requirements (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc.html), which include:

- Academic Transcripts (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/academic-transcripts.html)
- Test Scores (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/test-scores.html) (if required)
- Applicant Statements (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/statements.html)
- Résumé or Curriculum Vitae
- Letters of Recommendation (https://gsas.nyu.edu/nyu-as/gsas/admissions/arc/letters-of-recommendation.html), and
- A non-refundable application fee (https://gsas.nyu.edu/admissions/arc.html#fee).

See Mathematics (https://gsas.nyu.edu/admissions/arc/programs/mathematics.html) for admission requirements and instructions specific to this program.

Program Requirements

The program requires the completion of 36 credits, comprised of the following:

Course	Title	Credits
Major Requirements		
Mathematics Core		
MATH-GA 2010	Numerical Methods I	3
MATH-GA 2020	Numerical Methods II	3
Select two of the following:		6
MATH-GA 2701	Methods of Applied Mathematics	
MATH-GA 2490	Introduction to Partial Differential Equations	
MATH-GA 2702	Fluid Dynamics	
MATH-GA 2704	Applied Stochastic Analysis	
MATH-GA 2962	Mathematical Statistics	
MATH-GA 1002	Multivariable Analysis	
Computer Science Core		
CSCI-GA 1170	Fundamental Algorithms	3
CSCI-GA 2110	Programming Languages	3
Select two of the following:		6
CSCI-GA 2246	Open Source Tools	
CSCI-GA 2270	Computer Graphics	
CSCI-GA 2565	Machine Learning	
CSCI-GA 2566	Foundations of Machine Learning	
DS-GA 1001	Introduction to Data Science	
DS-GA 1003	Machine Learning	
DS-GA 1004	Big Data	
Electives		
Three elective courses		9
Capstone		
Capstone project course		3
Approved Internship		
MATH-GA-3775	(optional course)	
Total Credits		**36**

Additional Program Requirements

Master's Project

The program culminates in a master's project, which serves to integrate the classroom material.

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
MATH-GA 2010	Numerical Methods I	3
CSCI-GA 1170	Fundamental Algorithms	3
Mathematics Elective		3
	Credits	**9**
2nd Semester/Term		
MATH-GA 2020	Numerical Methods II	3
CSCI-GA 2110	Programming Languages	3
Computer Science Elective		3
Elective Course		3
	Credits	**12**
3rd Semester/Term		
Computer Science Elective		3
Capstone Course		3
Elective Course		3
	Credits	**9**
4th Semester/Term		
Elective Course		3

Elective Course	3
Credits	**6**
Total Credits	**36**

Learning Outcomes

Upon successful completion of the program, graduates will have:

1. Acquired technical skills suitable for employment in research and development, whether in academia, government, or industry. The demand for the right combination of skills exceeds the supply; the student shall acquire both the mathematical facility and the computational skills required for working in a team on scientific investigations or in the development of scientifically engineered products.
2. Acquired a working knowledge of basic numerical methods.
3. Become acquainted with the numerical solution of differential equations, including ordinary differential equations and elementary partial differential equations.
4. An understanding of elementary asymptotic analysis, including simple scaling arguments and dimensional analysis.
5. Familiarity with fundamental concepts of optimization, as illustrated by linear programming, convex programming, gradient-based optimization (such as Newton methods), or the calculus of variations.
6. Acquired a working knowledge of basic algorithms as typically encountered in computer-science courses introducing the fundamental data structures.
7. The ability to program or script in multiple languages, as well as understand various paradigms for the design of programming and scripting languages.
8. A working knowledge of the most common types of programming tools, including those available in a major operating system such as Unix.
9. Experience with mathematical and numerical modeling, as well as their appearance in various scientific applications.

Policies

NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).

Graduate School of Arts and Science Policies

Academic Policies for the Graduate School of Arts and Science can be found on the Academic Policies page (https://bulletins.nyu.edu/graduate/arts-science/academic-policies/).