Northeastern University
College of Science

Graduate Programs in Applied and Industrial Mathematics

Mathematics is of ever-increasing importance to our society and everyday life. It has long been the language of science and technology and provides a rich source of methods for analyzing and solving problems encountered in the physical world. Today, mathematics is essential in virtually all fields of human endeavor, including business, the arts, and the social sciences.

During a Master of Science in Mathematics you will study the tools and models of modern mathematics. Whether your interest is in medicine, data science or the fundamental modeling of the universe, a degree in mathematics with equip you with the tools for a career analyzing the hard problems of the 21st century.
https://cos.northeastern.edu/admissions/graduate-programs/

Department of Mathematics Graduate Programs:

Masters Programs:
Master of Science in Pure Mathematics
Master of Science in Applied Mathematics (MSAM)
- Data Science Track

Master of Science in Operational Research(MSOR)

PhD Programs:
PhD in Mathematics
- Pure Mathematics
- Discrete Mathematics
- Probability/Statistics

Department Information:

33 Research Faculty
- Algebra and Algebraic Geometry
- Analysis and PDEs
- Combinatorics & Discrete Math
- Probability & Statistics
- Topology & Singularities
- Machine Learning

112 Graduate Students
- 34 PhD Students
- 78 Master Students

Regular Seminars and Colloquia

Graduate Level Coop Program

Master of Science in Applied Mathematics: (MSAM, Data Science Track)

From data science to finance to education, applied mathematicians are in more demand than ever. The explosion of data science has seen billions of dollars of growth in analysis positions, with thousands of jobs in New England alone. Applied mathematicians' wide knowledge of mathematical models in addition to statistics and learning algorithms make them strong candidates for these jobs. https://cos.northeastern.edu/master-of-science-applied-mathematics/

The MSAM program is masters by coursework. The program is 32 credit hours, or 8 courses over 2 years (full time) or 4 years (part time) with an optional coop term. Students can take two elective courses from computer science.

Course Offering Examples:

Probability I & II	Mathematical and Applied Statistics
Financial Math and Stochastic Differential Equations	Optimization and Complexity
Machine Learning	Mathematical Modeling
Applied Linear Algebra	Multivariable Calculus for Engineering

http://catalog.northeastern.edu/graduate/science/mathematics/applied-mathematics-ms/#programrequirementstext

Master of Science in Operations Research (MSOR):

Taught in conjunction with the Department of Engineering, Operations Research deals with the application of scientific method to decision making. Its practitioners develop and solve mathematical and computer models of systems using optimization and statistical methods. Operations Research methodologies are being used to improve efficiency, reduce costs, and increase profitability in all organizations whether in manufacturing, transportation, logistics and supply chains, healthcare, or financial institutions.

The MSOR program is masters by coursework, but research opportunities may be developed by interested students. The program is 32 credit hours, or 8 courses over 2 years (full time) or 4 years (part time) with an optional coop term.

Course Offering Examples:

Probability I & II	Mathematical and Applied Statistics
Deterministic Operations Research	Optimization and Complexity
Numerical Methods in Mathematics	Mathematical Modeling
Inventory Theory	Logistics, Warehousing and Scheduling

http://catalog.northeastern.edu/graduate/science/mathematics/msor/#programrequirementstext

Graduate Coop Program:

Mathematics students have a wide range of co-op opportunities, including

- Fortune 500 insurance and investment companies
- Teaching assistantships in local public schools and
- Research assistants in Northeastern University labs
- Algorithm design and modeling for medical applications

Recent Coops:

Employer	Position
Fidelity Investments	Consumer Analytics and Insights
AIR Worldwide (Linkedin)	Software Quality Assurance
Woods Hole Oceanographic Institute	Climate Modeling & Data Analysis
Guy Carpenter	Catastrophe Modeling Services Assistant
Surface Oncology	Medical Data Science
Legendary	Special Effects and Data Science

After Graduation:

Some recent positions obtained by MSAM and MSOR Graduates:

Employer	Position
Merrill Lynch	Associate, Predictive Analytics
AIG	Senior Risk Analyst
Wayfair	Analyst
RoboAdvisor	Product Manager
Hulu	Data Science Lead
Northeastern University	Doctoral Student in Applied Mathematics

Students Experiences:

https://cos.northeastern.edu/news/qa-with-tigran-melkonian-ms-in-applied-mathematics/
https://cos.northeastern.edu/news/qa-with-karissa-stisser-ms-applied-mathematics/

Applied Mathematics

MASTER OF SCIENCE

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Experts are constantly discovering new applications for mathematics, and established techniques are being used in new ways within emerging fields. Understanding these developments can benefit professionals in finance, investment management, data science, and more.

The Master of Science in Applied Math program combines weekly seminars, co-ops, and research opportunities to help you develop skills and a career direction in the growing field of applied mathematics and modeling.

As applied mathematics continues to impact finance- and tech-based industries, you will have the skills you need to implement new concepts and advance both your field and your personal career.

PROGRAM BENEFITS

- **Learn from expert academics and professionals** with expertise in state-of-the art mathematics and computational practice.
- **Enjoy a flexible program** with evening classes, full-time or part-time coursework, and the opportunity to take classes outside of the department.
- **Gain real-world experience** and expand your skill set through Northeastern's co-op program.

PROGRAM OUTCOMES

Students who complete the program will be able to:

- **Understand the connections** between mathematical methods and modern computer science.
- **Use statistical and probabilistic reasoning** and other modeling techniques to interpret information.
- **Implement** model fitting and model design techniques.

CURRICULUM OUTLINE

The degree is a master's by coursework, with an optional data science track.

Core Requirements
- Introduction to Mathematical Methods and Modeling
- Algebra and Analysis (choose one):
  - Analysis 1: Functions of One Variable
  - Algebra 1
  - Probability 1
- Statistics (choose one):
  - Mathematical Statistics
  - Applied Statistics
- Math Electives: 12 semester hours
- External Electives: 8 semester hours

Sample Data Science Track Courses
- Machine Learning
- Data Mining Techniques
- Collecting, Storing, Retrieving Data
- Introduction to Data Mining/ Machine Learning

Sample Electives
- Machine Learning and Statistical Learning Theory
- Numerical Analysis and Optimization
- Stochastic Calculus and Introduction to Non-Arbitrage Finance
- Regression, ANOVA, and Design

Total Degree Requirements (32 Semester Hours)

"I credit Northeastern's Masters of Applied Mathematics with opening many doors for me… The people I had the opportunity to interact with in the department were intelligent, thoughtful, and kind. The faculty members were patient. My coursework was challenging and gratifying… In addition to the department's classes, I strongly recommend the MSAM program to anyone inclined towards a technical or analytics career."

Jacqueline Garrahan, MSAM 2019

N Northeastern
College of Science

A Northeastern University College of Science degree opens doors, creates possibilities, and expands minds. The College of Science delivers a demanding, experience-driven education—producing graduates who innovate, push boundaries, and are uniquely poised to pursue their professional goals. Our educational environment enables students to discover their passions and talents in multiple areas of interest. Through research and industry experience, students gain the confidence to follow their dreams and have an impact on the world.

Northeastern University

Founded in 1898, Northeastern is a global research university and the recognized leader in experience-powered lifelong learning. Our world-renowned experiential approach empowers our students, faculty, alumni, and partners to create impact far beyond the confines of discipline, degree, and campus.

Our locations—in Boston; the Massachusetts communities of Burlington and Nahant; Charlotte, North Carolina; the San Francisco Bay Area; Seattle; London; Toronto; and Vancouver—are nodes in our growing global university system. Through this network, we expand opportunities for flexible, student-centered learning and collaborative, solutions-focused research.

Northeastern's comprehensive array of undergraduate and graduate programs—in on-campus, online, and hybrid formats—lead to degrees through the doctorate in nine colleges and schools. Among these, we offer more than 140 multidisciplinary majors and degrees designed to prepare students for purposeful lives and careers.

The Connected PhD

FROM THE NORTHEASTERN COLLEGE OF SCIENCE

Northeastern University
College of Science

CONNECT ACROSS FIELDS WITH COLLABORATIVE RESEARCH

- **Conduct important fundamental or applied research** with personalized mentorship.
- **Explore opportunities for collaborative** research across disciplines.
- **Earn a prestigious PhD Degree** and the ability to be a strategic, independent thinker.

CONNECT WITH WORK EXPERIENCE TO SET UP YOUR CAREER

- **With the PhD Network,** you can be matched with expansive work opportunities.
- **Develop an extensive network** of prospective employers and connections.
- **As a PhD trainee**, you will be sought after and poised to enter a top career.

CONNECT WITH PROFESSIONAL AND ENTREPRENEURSHIP ACUMEN

- **Train in professional practices,** communication and entrepreneurship.
- **Join the NU LEADERS track**, and in joint programs across the College of Science.
- **Gain powerful problem-solving skills,** that promote career flexibility.
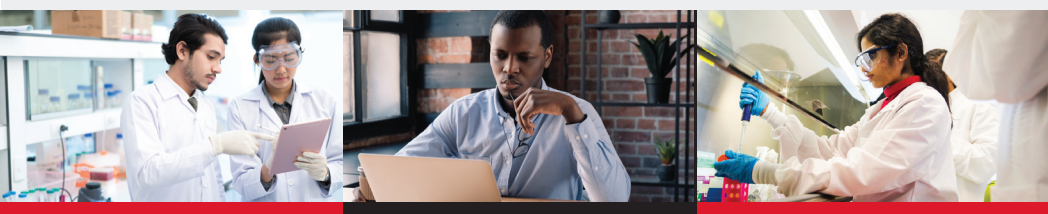
The PhD REINVENTED

The Connected PhD from the College of Science is a unique pathway to extraordinary career opportunities. This top degree includes: groundbreaking research; the ability to work across disciplines; and extensive, varied work experience that opens your future. Tuition and stipend provided.

> **The LEADERS program brought a unique dimension to my PhD experience that usually one gains after joining the workforce. The opportunity to partner with industry not only proved extremely valuable on the research side, but it also allowed me to hone my soft skills to make me a more valued asset."**
>
> - Lucas Almeida, Northeastern PhD Student

PREPARE FOR AN OUTSTANDING, HIGH-LEVEL CAREER

- **Research:** Academia, Industry, Government
- **Industry:** Biotechnology, Pharmaceutical, Chemical
- **Communication:** Science Writing and other Media
- **Policy:** Government, Ethics, Security, Science Policy
- **Business:** Consulting, Management, Finance, Entrepreneurship
- **Education:** Practice and Leadership

connects

The Connected PhD

FROM THE NORTHEASTERN COLLEGE OF SCIENCE

Northeastern University
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Apply to the Connected PhD

- Apply to the College of Science department or program of greatest interest to you at cos.northeastern.edu

- You will be admitted into a specific College department or program and also into the Connected PhD program, run jointly with the NU PhD Network.

- The program includes a full tuition scholarship, a graduate assistant position with stipend, and health insurance.

All programs require a completed application via ApplyYourself including:

- 3 Letters of Recommendation
- Optional GRE General Scores
- A personal statement
- Unofficial transcripts from all institutions attended
- Official transcripts, in certified English translation if from an institution outside of the United States, are required of all enrolled students by the first day of the entry term
- Proof of English Proficiency
- A resume

For more detailed information, please refer to our website:
cos.northeastern.edu

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> **"I was challenged to use my technical background, expertise and know-how to effectively address real life problems. As a PhD student with a technical bent, these skills are important to translate my work to improve people's lives."**
>
> - Amissi Sadiki, Northeastern PhD Student

DEADLINES		
Fall admissions only	Priority deadline for completed applications **December 1st**	Rolling admissions until **March 15th** pending availability

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