MATHEMATICS, MS

Contact

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Faculty

Uday Banerjee, Pinyuen Chen, Dan Coman, Steven Diaz, Shukai Du, Nicole L. Fonger, Pierre Yves Gaudreau Lamarre, Jack E. Graver, Duane Graysay, Pawel Grzegrzolka, Thomas John, Lee Kennard, Hyune-Ju Kim, Justin Ko, Leonid Kovalev, Graham J. Leuschke, Wei Li, Jianxuan Liu, Adam Lutoborski, Rachana Maharjan, Joanna O. Masingila, Moira McDermott, Jeffrey Meyer, Claudia Miller, Jani Onninen, Josh Pollitz, Declan Quinn, Hamidreza Rahmati, Lixin Shen, Gregory Verchota, Stephan Wehrli, William Wylie, Yuan Yuan, Yiming Zhao

The Department of Mathematics has 33 faculty members, with research interests in several areas of mathematics, statistics, and mathematics education, and approximately 55 graduate students. The department is housed in the recently renovated Carnegie Library building on the main campus quadrangle. Programs of study include those for M.S. and Ph.D. degrees in Mathematics, with or without a concentration in Statistics, and for M.S. and Ph.D. degrees in Mathematics Education.

Research Areas

The department's Colloquium series features weekly lectures by mathematicians from all over the United States and abroad in many of the areas of mathematical research represented in the department. Furthermore several of the research groups organize regular research seminars. Colloquia and seminar schedules, along with other information about our programs, courses, and events, can be found at artsandsciences.syracuse.edu/mathematics/ (https://artsandsciences.syracuse.edu/mathematics/)..

The following research groups are currently represented in the department.

Algebra

Algebraic geometry (moduli spaces of curves, equations defining finite sets of points), commutative algebra (homological algebra, Cohen-Macaulay modules, characteristic p), non-commutative algebra (representations of finite-dimensional algebras, homological algebra, group actions on non-commutative rings, Hopf algebras, enveloping algebras, non-commutative algebraic geometry). Faculty: Diaz, Leuschke, Miller, Pollitz, Quinn

Analysis

Complex analysis (several complex variables, pluripotential theory, complex dynamics, invariant metrics, holomorphic currents, Kähler geometry, rigidity problems), geometric analysis (PDE on manifolds, geometric flows), harmonic analysis, partial differential equations (linear and nonlinear elliptic PDE, boundary value problems on nonsmooth domains), geometric function theory (quasiconformal mappings, analysis on metric spaces). Faculty: Coman, Kovalev, Onninen, Verchota, Wylie, Zhao

Applied Mathematics

Numerical analysis (approximate solutions of elliptic PDE, generalized finite element methods and meshless methods), nonlinear variational problems (microstructure in nonlinear elasticity), applied and computational harmonic analysis (wavelets, digital image processing), numerical linear algebra, scientific machine learning. Faculty: Banerjee, Du, Lutoborski, Shen

Combinatorics

Combinatorics, graph theory, rigidity theory, symmetries of planar graphs, automorphism groups of graphs. Faculty: Graver

Geometry/Topology

Low-dimensional topology and knot theory (knot concordance, Heegaard Floer homology, homology theories for knots and links), Riemannian/Kähler geometry (curvature and topology, symmetry, special metrics, geometric flows, rigidity problems), convex geometry (Minkowski problems, sharp isoperimetric inequalities). Faculty: Kennard, Wehrli, Wylie, Zhao

Mathematics Education

Secondary mathematics education, teacher learning, mathematical representations, out-of-school mathematics practice, teacher development. Faculty: Fonger, Graysay, Masingila

Probability

Probability theory, functional analysis, and mathematical physics; Random Schrödinger operations, stochastic partial differential equations, random matrices, and free probability. Faculty: Gaudreau Lamarre, Ko

Statistics

Ranking and selection theory with applications in signal processing and multistage clinical trials, change-point problems with applications in cancer trend analysis, sequential analysis, nonparametric and semiparametric statistics, Bayesian inference, causal inference, measurement error models, high-dimensional data analysis. Faculty: Chen, Kim, Ko, Li, Liu

Graduate Awards

Graduate Scholarships

Support graduate study for students with superior qualifications; provide, in most cases, full tuition for the academic year.

Graduate Assistantships

Offered to most Graduate Scholarship recipients; no more than an average of 20 hours of work per week; nine months; stipend in addition to tuition scholarship for 24 credits per year. Additional summer support is generally available.

Syracuse University Graduate Fellowships

Tax-free stipends for nine months of full-time study; tuition scholarship for 15 credits per semester for a total of 30 credits during the academic year.

Facilities

The mathematics collection is held within the Carnegie Library and supports mathematical research over a broad range of pure and applied mathematics, as well as mathematics education, mathematical statistics, and interdisciplinary areas. Most of the non-book resources are online

and include an extensive collection of databases and journals supporting the mathematical sciences. In addition, the library provides a growing collection of ebooks.

Students may borrow course reserved textbooks, laptops, TI graphing calculators, and geometry kits from the Carnegie Library service desk. Students may also reserve one of three group study rooms located on the first floor of the library. A computer lab in the library provides software for programming, statistical and data analysis, video and multimedia, and access to printers.

Carnegie Library is home to collections in the sciences, including engineering and computer science, the life sciences, and the physical sciences and hosts a strong collection of databases, journals, and ebooks supporting all disciplines. The historic Reading Room gives the library a distinctive ambience and provides a quiet place for students to study.

Student Learning Outcomes

1. Demonstrate competency beyond the undergraduate level in the core areas of algebra and analysis by solving problems using advanced techniques
2. Demonstrate competency beyond the undergraduate level in an area of applicable mathematics by solving problems using advanced techniques
3. Read and construct rigorous proofs
4. Effectively communicate mathematical ideas

M.S. in Mathematics

The Department of Mathematics offers two programs leading to the Master's of Science in Mathematics degree. The programs are: (1) Mathematics (including pure and applied mathematics) and (2) Statistics. Master's programs share MAT 601 Fundamentals of Analysis I and MAT 631 Introduction to Algebra I as common foundations, and there is additional overlap between them.

Thirty credits of graduate work are required, of which at least 18 must be at the 600-level or above, and at least 15 of those 18 credits must be in the mathematics department. In the mathematics option the student must also complete MAT 602 Fundamentals of Analysis II, MAT 632 Introduction to Algebra II, and a sequence in applied mathematics from an approved list of sequences. In the statistics option several particular courses are required.

Students must have at least a B average in the 15 credits of 600-level or above mathematics department courses and at least a B average in the 30 credits of coursework comprising the degree program. No master's thesis is required.