MASTER OF SCIENCE IN MATHEMATICS

Program Director

G. Jay Kerns
620 Lincoln Building
(330) 941-3310
gkerns@ysu.edu

Program Description

The Department of Mathematics and Statistics offers the M.S. degree in mathematics. Options for this degree include:

- predoctoral studies,
- applied mathematics,
- computer science,
- secondary mathematics,
- statistics, and
- actuarial science.

Graduate faculty members have a broad range of research interests in both pure and applied areas. The curriculum stresses theoretical as well as computational mathematics and is flexible enough to key a student's program to individual interests and abilities. Receiving a well-rounded education in mathematics, graduates can pursue a Ph.D., secure a position in government or industry, or further a teaching career. The department has extensive computing facilities that include microcomputers, workstations, mainframe, and access to supercomputers.

Admission Requirements

In addition to the minimum College of Graduate Studies admission requirements, students must also have the following:

COURSE	TITLE	S.H.
A cumulative undergraduate cumulative grade point average of at least 3.0 (on a 4.0 scale) in all undergraduate mathematics an statistics courses.		
A completed sequence in standard calculus comparable to:		
MATH 1571	Calculus 1	4
MATH 1572	Calculus 2	4
MATH 2673	Calculus 3	4
Previous courses in discrete structures and linear algebra comparable to:		
MATH 3715	Discrete Mathematics	3
MATH 3720	Linear Algebra and Matrix Theory	3
Previous course in abstract algebra comparable to:		
MATH 5821	Topics in Abstract Algebra	4
MATH 5851	Topics in Analysis	4
The Graduate Record Examination		

Students not satisfying all of the above may be admitted with provisional status subject to the approval of the graduate program director and the graduate dean.

Guang-Hwa (Andy) Chang, Ph.D., Professor
Biostatistics

Jozsi Z. Jalics, Ph.D., Associate Professor
Computational neuroscience; mathematical biology; dynamical systems; partial differential equations

G. Jay Kerns, Ph.D., Professor
Signed measures; infinite divisibility; exchangeability in probability and statistics; applications of stochastic processes

Lucy Xiaojing Kerns, Ph.D., Assistant Professor
Simultaneous confidence bands; minimum effective doses; benchmark dose methodology

Thomas L. Madsen, Ph.D., Assistant Professor
Abstract algebra; group theory; representation theory

Nguyet Thi Nguyen, Ph.D., Assistant Professor
Financial models; Monte Carlo simulation; actuarial science

Anita C. O'Mellan, Ph.D., Professor
Graph theory; combinatorics; early childhood mathematics education

Stephen Rodabaugh, Ph.D., Professor
Foundations of topology and fuzzy logic: point-set, lattice-theoretic, and categorical methods

Thomas Smotzer, Ph.D., Professor
Real analysis; measure theory; operator theory

Angela Spalsbury, Ph.D., Professor
Functional analysis; operator theory; measure theory

Jamal K. Tartir, Ph.D., Professor
Set-theoretic topology

Thomas P. Wakefield, Ph.D., Associate Professor
Character theory; actuarial science

Eric J. Wingler, Ph.D., Professor
Real analysis; complex analysis; operator theory

George Yates, Ph.D., Professor
Applied mathematics; partial differential equations; mathematical biology; nonlinear waves

- A minimum of 33 semester hours of credit excluding MATH 5821 Topics in Abstract Algebra and MATH 5851 Topics in Analysis
- A cumulative grade point average of at least 3.0
- Students entering without a prior course in abstract algebra must include MATH 5821 Topics in Abstract Algebra in their program, to be taken in the earliest available semester, and students entering without a prior course in theoretical analysis must include MATH 5851 Topics in Analysis in their program, to be taken in the earliest available semester. These courses are not included in the 33-semester-hour minimum requirement.
- The student's combined undergraduate and graduate programs must include a mathematics core comprising the following courses or their equivalent:

COURSE	TITLE	S.H.
MATH 5821	Topics in Abstract Algebra (taken in the earliest available semester)	4
MATH 5851	Topics in Analysis (taken in the earliest available semester)	4
MATH 5825	Advanced Linear Algebra	3
MATH 5852	Real Analysis 2	3
MATH 6996	Mathematical Project	1-3

- Satisfactory performance on written and oral examinations. The subject matter for these examinations must be approved by the Graduate Executive Committee. Additionally, the following distribution requirements apply:
  - Written exams in MATH 5852, Math 5825 and the first course in the student's chosen course sequence
  - Oral exam on thesis, or oral exam on a project and two courses

- At least half of the hours of the courses examined must be at the 6900 level

- At least 17 hours of the student's approved program must be at the 6900 level. In addition to completing the courses which make up the mathematics core, students must complete at least one course sequence for depth and at least fifteen additional hours of elective courses to satisfy the breadth requirement for the degree. The course groupings are described below.
- MATH 6999 Thesis is highly recommended
- Before completing 12 semester hours, the student must submit the entire degree program for approval and evaluation by the Graduate Executive Committee in the Department of Mathematics and Statistics. Subsequent revisions to this program must be approved by the Graduate Executive Committee. An abstract of a proposed thesis must be submitted for approval prior to registering for the course.
- Students must participate in an exit interview during the semester in which they plan on graduating. The exit interview will be conducted with one or more members of the Graduate Executive Committee and must be scheduled by the student prior to the thesis or project presentation.

Course Sequences for Depth

The description of the recommended course sequences for depth will refer to the following list. The sequences offered depend upon student interest.

COURSE	TITLE	S.H.
Abstract Algebra		
MATH 6922	Advanced Topics in Group and Ring Theory	
MATH 6923	Advanced Topics in Field Theory	
Actuarial Mathematics		
STAT 5802	Theory of Interest	
Advanced Data Analysis		
STAT 6940	Advanced Data Analysis	
STAT 6948	Linear Models	
MATH 6955	Advanced Differential Equations	
MATH 6957	Partial Differential Equations	
Mathematical Statistics		
STAT 6943	Mathematical Statistics 1	
STAT 6944	Mathematical Statistics 2	
Operations Research		
MATH 5845	Operations Research	
MATH 6942	Advanced Operations Research	
Topology		
MATH 6980	Topology 1	
MATH 6981	Topology 2	

Predoctoral Studies in Mathematics and Applied Mathematics

COURSE	TITLE	S.H.
MATH 6922	Advanced Topics in Group and Ring Theory	
MATH 6923	Advanced Topics in Field Theory	
MATH 6975	Complex Analysis 1	
MATH 5852	Real Analysis 2	
MATH 6980	Topology 1	
STAT 6940	Advanced Data Analysis	
MATH 6955	Advanced Differential Equations	
STAT 6943	Mathematical Statistics 1	
MATH 5861	Numerical Analysis 2	
MATH 5845	Operations Research	
Electives		
Select two or more sequences in areas of interest		
Total Semester Hours		**0**

Statistics

COURSE	TITLE	S.H.
Core Requirements		
STAT 6940	Advanced Data Analysis	3
STAT 6948	Linear Models	3
STAT 6943	Mathematical Statistics 1	3
STAT 6944	Mathematical Statistics 2	3
Electives		
Select 9 additional hours of statistics courses.		9
Total Semester Hours		**21**

Actuarial Science

COURSE	TITLE	S.H.
Core Requirements		
STAT 5802	Theory of Interest	3
STAT 6943	Mathematical Statistics 1	3
STAT 6944	Mathematical Statistics 2	3
Electives		
Select from statistic and actuarial science course offerings		
Total Semester Hours		**9**

Applied Mathematics

COURSE	TITLE	S.H.
Core Requirements		
STAT 6940	Advanced Data Analysis	
MATH 6955	Advanced Differential Equations	
STAT 6943	Mathematical Statistics 1	
MATH 5861	Numerical Analysis 2	
MATH 5845	Operations Research	
Depth Requirement		
Select the second course in on e of the sequence		
Total Semester Hours		**0**

Secondary/Community College Mathematics

COURSE	TITLE	S.H.
MATH 6915	Mathematical Foundations	
STAT 6940	Advanced Data Analysis	
or		
STAT 6943	Mathematical Statistics 1	
or STAT 6940	Advanced Data Analysis	
Select one of the following:		3
MATH 6922	Advanced Topics in Group and Ring Theory	
MATH 6923	Advanced Topics in Field Theory	
MATH 6975	Complex Analysis 1	
MATH 6965	Abstract Analysis 1	
MATH 6980	Topology 1	
MATH 6922	Advanced Topics in Group and Ring Theory	
MATH 6923	Advanced Topics in Field Theory	
Those students seeking certification should consult an advisor in the school of Education.		
Total Semester Hours		**3**

Computer Science

Students in coursework in computer science in addition to mathematics should plan their graduate program in consultation with advisors in both the Department of Mathematics and Statistics and the Department of Computer Science and Information Systems.

Accelerated MS Mathematics

Undergraduate students can apply for admission into the accelerated program for the MS in Mathematics after completing 78 semester hours with a GPA of 3.3 or higher. After being admitted into the program, students can take a maximum of nine semester hours of graduate coursework that can count toward both an bachelor's and master's degree from the Department of Mathematics and Statistics. The courses chosen to count for both undergraduate and graduate coursework must be approved by the Graduate Executive Committee within the Department upon admission into the program. An additional six hours of graduate coursework can be completed as an undergraduate and used exclusively for graduate credit.

Learning Outcomes

Students will develop and demonstrate the ability to reason mathematically by constructing mathematical proofs and recognizing and analyzing accurate numerical data in appropriate core courses. Students will learn that truth in mathematics is verified by careful argument, and will demonstrate the ability to make conjectures and form hypotheses, test the accuracy of their work, and effectively solve problems.

Students will learn to identify fundamental concepts of mathematics as applied to science and other areas of mathematics, and to interconnect the roles of pure and applied mathematics.

Students will demonstrate that they can communicate mathematical ideas effectively, both orally and in writing, by completing a graduate project or thesis involving an investigative mathematical project, together with oral and written examinations.

Students in cooperative doctoral programs will demonstrate their ability to create significant, original mathematics.