3. A statement indicating a particular central theme or focus for a proposed Plan of Study.

4. Official transcripts for all prior undergraduate and graduate work documenting an undergraduate and/or graduate GPA of at least 3.0.

Applications are reviewed three times annually; visit www.brockport.edu/graduate for details on the application deadlines for this program. At each of the three deadlines, completed applications are reviewed to select the most qualified candidates. Because admission is on a competitive basis, applicants should be aware that the stated minimum criteria only guarantee consideration for admission, not admission itself.

**General Structure of the Liberal Studies Program**

To receive a Liberal Studies degree, students must earn a total of 30 graduate credits. Since The College at Brockport graduate courses are generally three credits each, a normal Plan of Study consists of 10 graduate courses. These courses include four required Liberal Studies courses and six elective courses. The required block includes (a) one course from each of three disciplinary perspectives: the arts and humanities, the natural sciences, and the social sciences; and (b) the Project Portfolio, a synthesizing experience entailing both a reflective component and a knowledge application component based on the student’s individual Plan of Study.

In the Liberal Studies program, elective courses are selected through advisement (a required procedure that must be completed before a student may continue with the matriculation process). The electives must reflect a programmatic theme or focus that satisfies the degree candidate’s personal and/or professional goals. The following restrictions apply to the selection of these courses:

1. At least two elective courses (six credits) must be at the 600-level or higher (i.e., courses designed exclusively for graduate students).

2. No more than two courses (six credits) may reflect content intended for application in a specific professional setting (these courses are usually designated as “B” courses at The College at Brockport).

3. No more than three courses may be taken within the same department or discipline (e.g., History, English, etc.).

4. No more than six credits may be taken as Independent Study.

5. No elective course may be taken on a “Satisfactory/Unsatisfactory” grade basis.

6. No internships allowed

7. Written approval of the program director is required for any change to a matriculated student’s Plan of Study.

**Required Liberal Studies Courses**

**LST 700-719 Topics in the Arts and Humanities.**
Varies according to instructor. 3 Cr. Every Semester.

**LST 720-739 Topics in the Natural Sciences.**
Varies according to the instructor. 3 Cr. Every Semester.

**LST 740-759 Topics in the Social Sciences.**
Varies according to the instructor. 3 Cr. Every Semester.

**LST 797 Project Portfolio.** Prerequisite: Instructor’s permission. Students may not register for this course until they have completed all of the Liberal Studies degree requirements or, in exceptional cases, are concurrently registered for their final course requirements (for a maximum of three credits subject to approval by the Director) as specified in their Plan of Study. A pre-graduation “culmination project” that entails both a reflective component and a knowledge application component. Includes (a) a statement of the specific programmatic goals around which the Plan of Study has been developed, (b) a reflective statement describing how the interrelationships between the areas of knowledge and skills acquired through the student’s Plan of Study have provided an integrative experience that has contributed holistically to one’s educational objectives, (c) a paper applying insights and/or methodologies from the three Liberal Studies disciplinary approaches (arts and humanities, the social sciences, and the natural sciences) to an understanding of some issue or problem with contemporary society, and (d) sample work from the student’s required and elective courses (Satisfactory/Unsatisfactory grading). 3 Cr. Every Semester.
Department of Mathematics
200 Albert W. Brown Building
Phone: (585) 395-2036;
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www.brockport.edu/math

Chairperson and Associate Professor: Mihail Barbosu, PhD, Paris Observatory and Paris VI University; Professor: Sanford S. Miller, PhD, University of Kentucky; Associate Professors: Dawn M. Jones, PhD, Western Michigan University; Gabriel T. Prajitura, PhD, University of Tennessee-Knoxville; Howard J. Skogman, PhD, University of California at San Diego; Charles J. Sommer, PhD, SUNY Buffalo; Assistant Professors: Jason R. Morris, PhD, University of Pittsburgh; Bogdan Petrenko, PhD, University of Illinois at Urbana-Champaign; Rebecca Smith, PhD, University of Florida; Pierangela Veneziani, PhD, Rutgers University; Ruhan Zhao, PhD, University of Joensuu, Finland.

The mission of the Master of Arts in Mathematics program is to provide students with a solid foundation in the major areas of mathematics, an appreciation for the structures and theories of advanced mathematics, and a deeper understanding of the role of mathematics in applications. The department strives to produce graduates who exhibit knowledge, comprehension and creativity in the practice of mathematics as they pursue their careers in college/high school teaching, business or government, or as they pursue doctoral studies.

The program is designed to meet the needs of a broad range of students, including mathematics teachers at the secondary and college levels, industrial mathematicians, computer professionals and prospective candidates for a PhD in mathematics. For example, individuals seeking permanent or professional certification in secondary mathematics may, following consultation with their advisors, develop an appropriate Plan of Study within the MA program. The Master of Arts in Mathematics program is quite flexible. The degree candidate chooses a core course in each of three areas: algebra, analysis and applied mathematics or statistics, and chooses seven other courses with the approval of the Mathematics Graduate Committee.

Please note that the information in this document is subject to change. For the latest information on our courses, please contact the department.

Admission

The applicant must possess a baccalaureate degree from an accredited institution (see the Graduate Admissions section in this catalog for further details) and have completed the equivalent of an undergraduate major in mathematics. (This usually means a minimum of 24 credits beyond calculus with an average of “B” or better. Deficiencies can be removed by taking remedial coursework, but these credits will not contribute to a student’s graduate Plan of Study. The applicant must submit to the Office of Graduate Admissions a completed application for admission as a matriculated student that includes official transcripts of all undergraduate and graduate studies and two letters of recommendation from persons who can attest to the applicant’s qualifications for graduate study.

Financial Assistance

A limited number of graduate assistantships are available. These carry a stipend and scholarship for up to 18 credits of tuition per academic year. To be eligible for a graduate assistantship, students must be full-time (i.e., registered for a minimum of nine credits a semester). Assistantship duties require 15 hours of work per week. Additional information may be obtained from the department office and the Office of Graduate Studies, (585)395-2525.

Student Advisement

Each student admitted to the Master of Arts in Mathematics program selects an advisor or is assigned one by the Graduate Committee. The student and advisor constitute the Advisory Committee for the student.
Plan of Study
The Advisory Committee has the responsibility of planning the student’s program and submitting a Plan of Study to the Graduate Committee for approval during the student’s first semester in the program.

The Plan of Study must include 30 credits of course work, with a minimum of 15 credits of mathematics at the 600 level or above. Of the 30 credits, a minimum of 21 credits must be in mathematics, as follows:

1. three core courses: algebra (MTH 621 or 629), analysis (MTH 651 or 659), applied mathematics or statistics (MTH 641 or 669); and
2. at least four additional approved graduate mathematics courses (which may include CSC 583).

The remaining credits are to be approved electives at the 500 level or above. These may be courses in mathematics, computer science, economics, education or other mathematics-related fields. Credit is not allowed for any course that substantially duplicates a course taken as an undergraduate or intended for graduate students in other disciplines.

Requirements for the Degree
Requirements for the Master of Arts in Mathematics include:

1. Course Work: 30 credits in an approved Plan of Study, as described above. Ordinarily, no more than six transfer credits are accepted. A cumulative grade point average of at least 3.0 is required for the courses in the Plan of Study.

2. Comprehensive Examination: After completing 24 or more credits of the courses included in the Plan of Study, the student must pass a comprehensive examination.

Satisfactory Progress
Students in the MA program in mathematics are expected to make satisfactory progress toward completion of their degree. Those who do not are subject to academic probation and dismissal. Please refer to the College’s policy concerning academic probation and dismissal as published in this catalog and as available on the Student Policies Web page at www.brockport.edu/policies.

Comprehensive Examination
The Comprehensive Examination is given two weeks after the fall semester ends, two weeks after the spring semester ends, or in August. It is based on the three core courses in algebra, analysis and applied mathematics/statistics included in the student’s Plan of Study.

The candidate will take a set of three exams. Each exam is subject to these rules:

a. an oral follow-up exam may be required in the case of inconclusive results, and
b. the exam may be taken only twice.

Mathematics Courses
MTH 512 History of Mathematics (A). Prerequisite: MTH 202 and either MTH 245 or MTH 281. Covers the history and development of mathematical ideas from primitive origins to today. Includes topics such as arithmetic, number theory, geometries, algebra, calculus and selected advanced topics. 3 Cr.

MTH 520 Mathematics for Adolescence Teachers (A). Prerequisite: MTH 432. Analyzes the adolescence mathematics curriculum (grades 5-12) from an advanced perspective. Topics include algebra, geometry, data analysis, statistics, trigonometry, discrete mathematics and calculus. Requires students to examine their own understanding of these topics as well as examine the theoretical underpinning of each. 3 Cr.

MTH 521 Number Theory (A). Prerequisites: MTH 202 and MTH 281. Topics include but are not limited to: mathematical induction, divisibility, primes, arithmetic functions, congruencies, modular arithmetic, Diophantine problems and the distribution of primes. 3 Cr.

MTH 526 Modern Algebra II (A). Prerequisite: MTH 425. Covers topics such as rings, ideals,
fields and further group theory. Course requires extensive proof writing. 3 Cr.

**MTH 530 Topology (A). Prerequisite: MTH 281.**
Provides a study of topologies on various spaces. Emphasizes theory, abstraction, proof techniques and clarifies these by means of many specific examples. Bridges topics such as geometry, analysis and algebra. Topics include, but are not limited to set theory, continuous functions, connectedness, compactness and separation. 3 Cr. Spring.

**MTH 532 College Geometry (A). Prerequisite: MTH 324.**
Studies geometry from the synthetic, analytic, transformational and vector viewpoints. Includes these topics: axiomatic systems, finite geometries, absolute geometry, Euclidean geometry, non-Euclidean geometries, geometric transformations and projective geometry. 3 Cr.

**MTH 541 Statistical Methods I (A). Prerequisite: MTH 243 or MTH 346 or an equivalent introductory statistics course.**
Covers estimation, hypothesis testing, simple regression, categorical data and non-parametric methods. Uses statistical analysis software. 3 Cr.

**MTH 542 Statistical Methods II (A). Prerequisite: MTH 541 or instructor’s permission.**
Covers one and two-way analysis of variance, multiple regression, experimental design and linear models. Uses statistical analysis software. 3 Cr.

**MTH 546 Probability and Statistics II (A). Prerequisites: MTH 203 and MTH 346.**
Covers the Central Limit Theorem, maximum likelihood estimation, method of moments, unbiased and sufficient statistics, minimum variance, Cramer-Rao lower bound, confidence intervals, Neyman-Pearson Lemma, power calculations and likelihood ratio tests. 3 Cr.

**MTH 556 Advanced Differential Equations (A). Prerequisites: MTH 255, MTH 324 or some exposure to matrix theory.**
Covers series solutions about singular points, systems of linear first-order differential equations, plane autonomous systems, Fourier series, Sturm Liouville problems, partial differential equations of physics including the heat, wave and Laplace equation. 3 Cr.

**MTH 557 Real Analysis (A). Prerequisites: MTH 203 and MTH 324.**
Provides a study of functions of a real variable. Emphasizes theory and proof techniques. Includes: real numbers, denseness of the rational numbers, convergence of sequences of real numbers, Cauchy sequences, Bolzano-Weierstrass theorem, continuous functions, uniform continuity, differentiable functions and integrable functions. Enhances understanding of the topics through a series of required writing tasks. 3 Cr.

**MTH 561 Deterministic Mathematical Models (A). Prerequisite: either MTH 245 or MTH 281 or instructor’s permission.**
Teaches applied mathematics techniques to be used in engineering, business, finance and other management fields. Includes linear programming, sensitivity analysis, the simplex method, shortest path method, integer linear programming and network models. 3 Cr.

**MTH 562 Stochastic Mathematical Models (A). Prerequisite: MTH 346.**
Teaches applied mathematical techniques to be used in engineering, business, finance and other management fields. Includes project scheduling, decision theory, simulation, risk analysis, multicriteria decision problems, inventory and queuing models, forecasting, dynamic programming and Markov analysis. 3 Cr.

**MTH 563 Graph Theory (A). Prerequisite: MTH 324 or instructor’s permission.**
Introduces graph theory, including distance concepts, symmetry and structure, trees and connectivity, Euclidean and Hamiltonian Graphs, planar graphs and embeddings and applications of graphs. 3 Cr.

**MTH 565 Combinatorics (A). Prerequisites: MTH 324 and instructor’s permission.**
Introduces combinatorics, including basic counting techniques involving permutations, combinations, compositions, and partitions; binomial coefficients; the twelve-fold way; recursions and generating functions. Other topics may include a more advanced study of permutations, sequences in combinatorics, magic squares, the probabilistic method, etc. 3 Cr. Spring.

**MTH 571 Numerical Analysis I (A). Prerequisite: MTH 203.**
Covers the development of methods used to numerically approximate the solutions to mathematical problems, with consideration given to generation and propagation of round-off errors, convergence criteria and efficiency of computation. Includes these topics: roots of nonlinear equations, systems of nonlinear and linear equations, polynomial approximations, numerical differentiation and integration, and curve fitting. Mathematical software, such as MAPLE, will be used. 3 Cr.

**MTH 581 Discrete Mathematics II (A). Prerequisites: MTH 201 and MTH 281.**
A second course in discrete mathematics. Includes: study of algorithms, recurrence relations, inclusion-exclusion principle, partial order and equivalence relations, graph theory, and trees. 3 Cr.

**MTH 599 Independent Study in Mathematics (A).**
To be defined in consultation with the instructor/ sponsor prior to registration. 1-3 Cr.

**MTH 605 Problem Solving in Mathematics (A). Prerequisite: Departmental permission.**
Develops problem-solving ability at the graduate level. Emphasis on meaning, strategies and written communication. Especially appropriate for adolescence mathematics teachers. 3 Cr.
MTH 619 Topics for Teachers I - Mathematical Modeling (A). Prerequisite: permission of instructor. Designed for secondary school mathematics teachers. Focuses on the use of the computer as a modeling device, and on mathematical models in the social and life sciences. Includes these topics: problem solving, algorithm design and the development of programming skills. 3 Cr.

MTH 621 Algebra (A). Prerequisite: MTH 425. Includes these topics: groups and subgroups, normal subgroups and quotient groups, permutation groups, finite Abelian groups, some special classes of rings, homomorphisms, ideals and quotient rings Euclidean rings and polynomial rings. 3 Cr.

MTH 628 Applications of Algebra (A). Prerequisites: MTH 425 and either MTH 621 or permission of instructor. Applies group theory and ring theory to the solution of polynomial equations and to problems in number theory, geometry, coding theory, combinatorics and selected areas of computer science. 3 Cr.

MTH 629 Topics in Algebra and Number Theory (A). Prerequisite: permission of instructor. Introduces topics of current interest in research or topics not covered in other courses in algebra and number theory. An outline of selected topics will be announced before the course is offered. 3 Cr.

MTH 639 Topics in Geometry (A). Prerequisite: MTH 324. Introduces topics of current interest in research or topics not covered in other courses in geometry. An outline of selected topics will be announced before the course is offered. 3 Cr.

MTH 641 Mathematical Statistics (A). Prerequisite: MTH 446 or MTH 546. Allows for rigorous development of probability concepts in the sample space and models for discrete and continuous random variables. Introduces bivariate normal distribution, transformation of variables, statistics and sampling distributions, Central Limit Theorem, parametric estimation, Rao-Cramer inequality, hypothesis tests, power functions, Neyman-Pearson Theorem and both UMP and Likelihood Ratio tests. 3 Cr.

MTH 651 Real Analysis (A). Prerequisite: MTH 457 or MTH 557. Includes topics such as uniform continuity and the Weierstrass Approximation Theorem, theory of differentiation and the Riemann integral, convergence of series of functions, uniform convergence of series of functions, functions of bounded variation, Riemann-Stieltjes integration, Lebesque measure and Lebesque integration. 3 Cr.

MTH 659 Topics in Analysis (A). Prerequisite: permission of instructor. Introduces topics of current interest in research or topics not covered in other courses in analysis. An outline of selected topics will be announced before the course is offered. 3 Cr.

MTH 669 Topics in Applicable Mathematics and Statistics (A). Prerequisite: permission of instructor. Introduces topics of current interest in research or topics not covered in other courses in applicable mathematics and statistics. An outline of selected topics will be announced before the course is offered. 3 Cr.

MTH 699 Independent Study in Mathematics (A). To be defined in consultation with the instructor/sponsor prior to registration. 1-3 Cr.

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