MATHEMATICS

The Programs

The Department of Mathematics offers:

- Mathematics Post-Baccalaureate Certificate (https://catalog.millersville.edu/graduate/college-science-technology/mathematics/mathematics-post-baccalaureate-certificate/)
- Mathematics, M.Ed. (https://catalog.millersville.edu/graduate/college-science-technology/mathematics/mathematics-med/)

Courses are designed to be of optimum value and relevance to teachers of mathematics in secondary schools. Mathematics teachers who are not pursuing a degree may enroll as nondegree students and elect any course in mathematics or mathematics education for which they have the prerequisites.

Admission Requirements

Admission to the M.Ed. program in mathematics education is granted to those applicants whose mathematical preparation fulfills the mathematical proficiency requirement (see I below). Conditional admission is granted to those applicants who have satisfactorily completed the following Millersville University undergraduate mathematics courses or their equivalents: MATH 161 Calculus 1, MATH 211 Calculus 2, MATH 311 Calculus 3 and MATH 322 Linear Algebra 1. Such persons are granted full admission status upon fulfillment of the mathematical proficiency requirement.

Buchanan, J; Professor
College of Science and Technology
B.S., Davidson College, 1983; M.S., North Carolina State University, 1985; Ph.D., Ibid., 1993

Cardwell, Antonia; Associate Professor
College of Science and Technology
B.S., University of the Witwatersrand (Johannesburg), 1998; M.A., Kent State University, 2001; Ph.D., Ibid., 2005

Dever, Lindsay; Assistant Professor
College of Science and Technology
B.S., The College of New Jersey, 2015; M.A., Bryn Mawr College, 2019; Ph.D., Bryn Mawr College, 2022

Fenwick, James; Professor
College of Science and Technology
B.S., Clarion State College, 1980; M.S., University of Vermont, 1983; Ph.D., University of Wyoming, 1985

Garber, Diana; Instructor
College of Science and Technology
B.A., Millersville University, 1991; M.Ed., Ibid., 1997

Han, Zhigang; Associate Professor
College of Science and Technology
B.A., Fudan University (China), 1997; Ph.D., Stony Brook University, 2006

Heitmann, Noel; Associate Professor
College of Science and Technology
B.S., The Pennsylvania State University, 1989; B.S., University of Pittsburgh, 1996; M.A., Ibid., 1998; Ph.D., Ibid., 2003

Ma, Baoling; Associate Professor
College of Science and Technology
B.S., Ocean University of China, 2007; Ph.D., University of Louisiana-Lafayette, 2012

Mikula, Richard; Professor
College of Science and Technology
B.S., Temple University, 1998; Ph.D., Rutgers, The State University of New Jersey, 2006

Moss, Erin; Professor
College of Science and Technology
B.A., University of North Carolina at Asheville, 2001; M.S., University of Connecticut, 2003; Ph.D., Purdue University, 2009

Robinson, Kevin; Associate Professor
College of Science and Technology
B.A., Messiah College, 1993; M.S., University of Florida, 1995; Ph.D., Ibid., 2000

Stewart, Patrick; Assistant Professor
College of Science and Technology
B.S., Marshall University, 2011; M.A., Ibid., 2014; M.S., Virginia Polytechnic Institute and State University, 2015; Ph.D., Bowling Green State University, 2020

Taylor, Cynthia; Professor
College of Science and Technology
B.S., Indiana University of Pennsylvania, 1988; M.S., Rensselaer Polytechnic Institute, 2002; Ph.D., University of Missouri, 2011

Washington, H; Associate Professor
College of Science and Technology
B.S., Fayetteville State University, 1998; M.S., North Carolina State University, 2001; Ph.D., Ibid., 2012

White, Janet; Professor
College of Science and Technology
B.A., Grove City College, 1988; M.Ed., Millersville University, 1994; Ph.D., American University, 2002

Wismer, Michael; Assistant Professor
College of Science and Technology
B.A., Messiah College, 1987; M.A., West Chester University, 1991; Ph.D., University of Delaware, 1997

Zhan, Mingquan; Professor
College of Science and Technology
B.S., Nanjing Normal University, 1990; M.S., Ibid., 1997; Ph.D., West Virginia University, 2003

MATH 500: 3-12 s.h.
Co-Op Ed Experience in Math
Co-Op Ed Experience in Math

MATH 502: 4 s.h.
Linear Algebra

Systems of linear equations, matrix algebra and determinants; real vector spaces, linear independence, basis and dimension; real inner product spaces, Gram-Schmidt orthogonalization; eigen theory and diagonalization; linear transformations and matrix representation. Prereq or Coreq: MATH 311; MATH 310/520 recommended.
MATH 503: 4 s.h.  
Probability and Stats for Tchr  
A rigorous one-semester study of probability, distribution theory and the basics of statistical inference. Topics include probability, expectation, discrete and continuous distributions, descriptive statistics and both estimation and hypothesis testing for one- and two-sample problems. Prereq: MATH 311.

MATH 504: 3 s.h.  
Modern Algebra for Teachers  
Algebraic properties of complex number systems, set theory, groups, rings, integral domains and fields. MATH 310/520 and MATH 322/502.

MATH 505: 4 s.h.  
Classical & Modern Geometry  
Study of geometry from both classical and transformational points of view. The classical part will focus on the axiomatic development of various forms of geometry; the transformational part will focus on the study of geometry in terms of two families of transformations: isometries and similarities. Emphasis on investigating geometry using both classical and transformational approaches and their interactions.

MATH 506: 3 s.h.  
Modern Analysis for Teachers  
Real number system, limits of sequences and functions, theory of differentiation, Reimann integration, infinite series. Prereq: MATH 310/520, 311, 322/502. MATH 345/504 recommended.

MATH 520: 3 s.h.  
Logic and Foundations of Math  
Theory of inference, symbolic logic, nature of axiom systems, validity of proofs, consistency, independence, completeness, theory of sets and cardinal numbers.

MATH 535: 3 s.h.  
Statistical Methods 1  
Survey of statistical methods used in research, education, behavioral science and biomedical applications. Experimental designs discussed regarding advantages, disadvantages, sampling problems and analysis. Regression and analysis of variance. Prereq: An elementary probability or statistics course. Offered in fall and periodically in summer.

MATH 536: 3 s.h.  
Statistical Methods 2  
Continuation and extension of statistical methods introduced in Statistical Methods I (Math 535). Advanced topics in analysis of variance, randomized block designs and experimental designs. Prereq: Math 535 or permission of instructor. Offered in spring.

MATH 536H: 3 s.h.  
Hon: Statistical Methods II

MATH 537: 1 s.h.  
Statistical Problem Solving Seminar  

MATH 566: 3 s.h.  
Complex Variables  
Complex number system, analytic functions, elementary functions, contour integration, residues and poles, conformal mapping. Prereq: MATH 506 or equivalent. Offered infrequently.

MATH 577: 3 s.h.  
Problems in Applied Math  
An investigation of one or more topics of current interest in applied mathematics. Specific topics to be covered vary but are announced each time the course is offered. Offered infrequently.

MATH 592: 3 s.h.  
Graph Theory  
Finite graphs, multigraphs, digraphs and networks from theoretical, practical and historical perspectives. Specific topics include isomorphisms, graph variants, planarity and nonplanarity, traversability, colorings, flows, matchings and optimization algorithms. Prereq: MATH 502 or equivalent. Offered periodically.

MATH 592H: 3 s.h.  
HNRS: Graph Theory

MATH 602: 3 s.h.  
Evolution of Mathematical Concepts from Antiquity to the Present Century  
Emphasis on eras of great mathematical activity.

MATH 603: 3 s.h.  
Equity Issues in Math Ed  
Designed for graduate level students with an interest in equity issues in mathematics education. In this course, we examine issues of equity in mathematics education from various theoretical and practical perspectives and long lines of race, gender, culture and socioeconomic status. It is a reading-intensive course that spans such topics as the achievement gap, tracking, culturally-relevant pedagogy, multiculturalism, the nature of mathematics and mathematics for democracy and social justice. Course assignments will be differentiated to ensure they are relevant to the concerns of both practicing teachers as well as students without a teaching background that intend to pursue further graduate study.

MATH 604: 3 s.h.  
Ethnomathematics  
This course aims to introduce Ethnomathematics as a field by examining mathematics across and within cultures. In addition, the course is designed to strengthen and expand students' understanding of mathematical topics (e.g., number systems, geometry, combinatorics, group theory) through study of the mathematics of world cultures. Furthermore, students will discuss ways in what is done in the course may be used to refresh or augment 7-12 school mathematics courses and develop school materials in Ethnomathematics.

MATH 606: 3 s.h.  
NOYCE - Transitioning  
Intended to address topics and concerns relevant to recently-certified NOYCE secondary mathematics teachers as they transition to their first year of teaching in a high-needs school district. Through readings, class discussions, individual presentations, and written assignments, participants reflect on their student teaching experiences, further explore challenges of working with diverse groups of students, and develop strategies to increase their effectiveness as a teacher in the context of a high-needs district. Instructor permission required.
MATH 617: 3 s.h.
Middle/Secdry Schl Innovatns
Current curricular issues and teaching strategies associated with educational innovations that are invariant with respect to the middle school-secondary school boundary. Central to this discussion will be the NCTM's Principles and Standards for School Mathematics and the PA Academic Standards for Mathematics. Prereq: teaching experience or permission of the instructor. Offered periodically

MATH 618: 3 s.h.
7-12 Assessment
Course for secondary mathematics teachers who wish to explore the nature of the mathematics assessment from a variety of perspectives. The course will examine traditional and non-traditional forms to assessment as well as the purpose of formative and summative assessments - allowing for discussion of the pros and cons to each. The course will also examine the impact of assessment tools on individual classroom instruction as well as within local departments, schools, districts, states and national education issues. The course will seek to actively involve teachers in a productive dialogue about the mathematics that they teach and explore a variety of levels at which the mathematics can be assessed. In order to do this, it will be necessary at times to expand and explore K-16 mathematics assessment at some length.

MATH 619: 3 s.h.
Advanced Perspectives
Course is for secondary mathematics teachers at the middle or high school level who wish to explore the nature of the mathematics that they teach from a different viewpoint. The course will look at typical secondary mathematics topics including the real number system, polynomials, number theory, trigonometry and Euclidean geometry while examining concept analysis, problem analysis and mathematical connections. The course will actively involve in-service and pre-service teachers in a productive dialogue about the mathematics that they teach, and potential developmental or extensions that could be put into practice at each level. The class will also explore a variety of levels at which it may be appropriate to address these issues with their own students.

MATH 620: 3 s.h.
21st Century Math
The intent of the course, Teaching Mathematics in The 21st Century, is to examine, study, and analyze teaching techniques and alternate approaches to teaching and learning mathematics in the 21st century. Students will experiment with a variety of pedagogies that are more in-line with the way in which 21st century students live rather than how they are often taught. Comparisons of multiple pedagogies (current, past and potential future) will be frequently made and discussed.

MATH 621: 3 s.h.
Linear Algebra
Vector spaces, linear transformations, matrices, systems of equations, determinants. Prereq: MATH 502 or equivalent. Offered infrequently.

MATH 622: 3 s.h.
Topics in Geometry
Topics selected from the parallel postulate and models for Euclidean and non-Euclidean geometries; projective geometry, local geometry of smooth space curves; geometry of smooth surfaces in space; geometry of space-time; finite geometries; representation of a geometry as a group of transformations acting on a set. Prereq: teaching experience or permission of instructor. Offered infrequently.
MATH 670: 3 s.h.
Operations Research
Principles of model building; examples from linear optimization, network
analysis, dynamic programming, probabilistic decision theory, Markov
chains, queuing theory, simulation and inventory models. Applications
and theory. Prereq: MATH 642 or equivalent, and a statistics course or
equivalent. Offered periodically.

MATH 672: 3 s.h.
Math Modeling in Secondary Sch
of the process of mathematical modeling. Creative and empirical model
construction, model analysis and model research. Problems taken from a
variety of disciplines. Some problems suitable for algebra and geometry
students; others require some knowledge of calculus and statistics.
Prereq: MATH 502 or its equivalent. Offered periodically.

MATH 675: 3 s.h.
Numerical Analysis
Numerical treatment of equations, matrices and systems of equations;
interpolation and approximation by polynomials; numerical integration;
method of least squares. Prereq: MATH 502 and MATH 506, or equivalent.
Offered in fall.

MATH 679: 3 s.h.
Technol in Secondary Schl Math
Introduction to technologies currently available for teaching secondary
mathematics. Emphasis on the use of modern graphics calculators,
although computer software is also presented. Capabilities of the
technologies examined in depth, but emphasis will be on the use of
this technology in the classroom. Mathematical topics selected from
elementary algebra, geometry, algebra II, precalculus and calculus.
Prereq: secondary teaching experience. Offered periodically.

MATH 683: 3 s.h.
General Topology
Set theory, metric and topological spaces, cluster points, closure, interior
and boundary, continuity, homeomorphisms, product and quotient
spaces, separation, compactness, connectedness, completeness. Prereq:
MATH 502, 504 and 506.

MATH 691: 3 s.h.
Combinatorics
Counting techniques including the multiplication principle, the addition
principle, the pigeon-hole principle, permutations, combinations, the
principle of inclusion-exclusion, recurrence relations, generating functions
and Polya’s Theory of Enumeration. Prereq: MATH 502 or equivalent.
Offered periodically.

MATH 693: 3 s.h.
Number Theory
The classic higher arithmetic of integers: mathematical induction,
divisibility, congruences, prime numbers, diophantine equations. Euler-
Fermat Theorem and quadratic reciprocity. Offered periodically.

MATH 695: 3 s.h.
Topics in Mathematics
Investigation of one or more mathematical topics of current interest not
covered in regular courses. Topics and methods of instruction may vary
according to the needs and interests of students and faculty involved.
Offered infrequently.

MATH 696: 1-3 s.h.
Independent Study
Selected topics. Prereq: permission of chairperson. Offered infrequently.

MATH 697: 1-3 s.h.
Independent Study
Selected topics. Offered infrequently.

MATH 699: 3-6 s.h.
Thesis:
Thesis