MATHEMATICS MINOR

Requirements
Mathematics Minor

A minor in Mathematics requires the completion of a minimum of 21 credits, consisting of the following courses:

Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MTH 111 – Calculus I</td>
<td>4</td>
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<tr>
<td>MTH 112 – Calculus II</td>
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<td>Any two MTH courses numbered 300 or higher, excluding MTH 303, MTH 391, and MTH 392</td>
<td>6-8</td>
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<td>and two of the following courses (electives):</td>
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<td>MTH 202</td>
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<td>MTH 211</td>
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<td>MTH 212</td>
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<td>MTH 214</td>
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<td>MTH 231</td>
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Minimum total credits required for a minor in Mathematics: 21-24

MTH. MATHEMATICS

MTH-198, MTH-289, MTH-398, MTH-498. TOPICS IN MATHEMATICS
Credits: Variable
A study of topics of special interest. It may be a continuation of intensive study of topics begun in the upper-level courses in analysis, topology, algebra, and probability. May be repeated for credit for a different topic.

Pre-Requisites
Varies with topic

MTH-84. COLLEGE PREPARATORY MATHEMATICS
Credits: 3
Three creditsDesigned for students who need to review basic mathematics skills before taking MTH 94, 101, or 103. Topics include a review of arithmetic, introductory algebra, and quantitative reasoning. Only P (passed) or F (failed) grades are given. Credits in this course will not be counted toward the graduation requirement in any degree program at Wilkes.

MTH-94. COLLEGE ALGEBRA
Credits: 3
Designed for students who need to review basic algebra before taking MTH-100 or MTH-150. Topics include polynomials, solution of equations and inequalities, exponents and radicals, graphing, and solution of systems of equations. Offered every fall.

MTH-100. PRECALCULUS
Credits: 3
A course in advanced algebra and trigonometry designed to prepare students for calculus. Topics include functions, inverse functions, logarithms, exponentials, and trigonometry.

Pre-Requisites
MTH 94 or meet Department of Mathematics and Computer Science placement criteria.

MTH-101. SOLVING PROBLEMS USING MATHEMATICS
Credits: 3
An introduction to the methodology of mathematical modeling as a technique in working towards the solution to real world problems. In an effort for the non-specialist to gain an appreciation of the use of mathematics in our society, topics are selected from among the following: basic voting theory, fair division schemes, routing problems, population growth, and descriptive statistics and probability.

MTH-103. MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS
Credits: 3
A study of the theory of arithmetic, structure of the number systems, and other topics relevant to the teaching of mathematics in elementary schools. Offered every fall.

Pre-Requisites
Admission to the Teacher Education Program or consent of the instructor.

MTH-104. MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS II
Credits: 3
A continuation of MTH-103. Topics include elementary probability, statistics, and geometry. Offered every spring.

Pre-Requisites
Admission to the Teacher Education Program or consent of the instructor.

MTH-111. CALCULUS I
Credits: 4
Calculus of functions of one variable. Topics include functions, limits and continuity, derivatives and integrals. Course will focus on applying conceptual aspects of calculus to modeling and solving problems from across the sciences and engineering.

Pre-Requisites
Student must have completed MTH-100 or meet Department of Mathematics and Computer Science placement criteria.

MTH-112. CALCULUS II
Credits: 4
A continuation of MTH-111. Topics include inverse functions, techniques of integration, applications of the integral, and infinite sequences and series.

Pre-Requisites
MTH-111.

MTH-114. CALCULUS AND MODELING FOR THE BIOLOGICAL AND HEALTH SCIENCES
Credits: 4
A continuation of MTH 111 for students in the biological and environmental sciences. Topics include integrals, differential equations and continuous dynamical systems, stochastic models and Markov chains, and discrete and continuous probability models. Course will focus on applying ideas from calculus to modeling and solving problems drawn from the biological and environmental sciences. Major credits cannot be granted for both MTH 112 and MTH 114.

Pre-Requisites
MTH-111.
MTH-150. ELEMENTARY STATISTICS  
Credits: 3  
Elementary statistical inference, with an emphasis on ideas, techniques, and applications in the life, physical, and social sciences. Topics include descriptive statistics, confidence intervals, hypothesis testing, contingency tables, multiple regression, and analysis of variance. Not open to mathematics majors or students with credit in MTH 351.  
Pre-Requisites  
MTH 94 or meet Department of Mathematics and Computer Science placement criteria.

MTH-202. SET THEORY AND LOGIC  
Credits: 4  
Provides a foundation in logic and set theory for upper-level courses in mathematics and computer science. Topics include the logic and language of proofs, the axiomatic method, sets, relations, and functions. Offered every fall.  
Pre-Requisites  
MTH-112 or consent of the instructor.

MTH-211. INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS  
Credits: 4  
First-order and linear higher order differential equations; matrices, determinants, and systems of differential equations; numerical and power series methods of solution; the Laplace transform. Offered every fall.  
Pre-Requisites  
MTH-112.

MTH-212. MULTIVARIABLE CALCULUS  
Credits: 4  
Differential and integral calculus of real and vector valued functions. Topics include continuity, partial differentiation, implicit functions, Taylor's Theorem, gradient, curl, line, surface, and multiple integrals, inverse functions, theorems of Green and Stokes. Offered every fall.  
Pre-Requisites  
MTH-112.

MTH-214. LINEAR ALGEBRA  
Credits: 3  
An axiomatic approach to vector spaces, linear transformations, systems of linear equations, Eigen values, and Eigen vectors. Offered every spring.  
Pre-Requisites  
MTH-112 or consent of the instructor.

MTH-231. DISCRETE MATHEMATICS  
Credits: 3  
Designed to provide background in discrete mathematics for upper level courses in computer science. Topics include basic counting principles, introduction to recurrence relations and their application in analyzing algorithms, basic properties of graphs, trees, and networks, AND, OR, and NOT gates and designing combinatorial circuits, finite-state automata, transducers, and Turing machines. Offered every spring.  
Pre-Requisites  
MTH-202 and CS-125 or consent of the instructor.

MTH-303. THE TEACHING OF MATHEMATICS IN MIDDLE LEVEL AND SECONDARY SCHOOLS  
Credits: 4  
This course deals with educational perspectives that pertain to the teaching of mathematics at the middle and secondary levels (grades 4 through 12). Topics of discussion include recommendations by the National Council for Teachers of Mathematics (NCTM) regarding instructional methods, assessment, techniques, and curricular issues. The course includes a 40-hour practicum. Offered in the fall semester of odd-numbered years.  
Pre-Requisites  
MTH 111 and Junior/Senior in Mathematics or Middle-Level Education plus admission to the Teacher Education Program.

MTH-311. REAL ANALYSIS  
Credits: 4  
A rigorous study of the topology of the real line, limits, continuity, differentiation, integration, and series of functions. Offered in the fall semester of even-numbered years.  
Pre-Requisites  
MTH-202 or consent of the instructor.

MTH-314. COMPLEX ANALYSIS  
Credits: 3  
Complex functions, limit, continuity, analytic functions, power series, contour integration, Laurent expansion, singularities, and residues. Offered when demands warrants.  
Pre-Requisites  
MTH-212 or consent of the instructor.

MTH-331. ABSTRACT ALGEBRA I  
Credits: 4  
A rigorous study of elementary number theory, groups, rings, and fields. Offered in the fall semester of odd-numbered years.  
Pre-Requisites  
MTH-202 or consent of the instructor.

MTH-343. GEOMETRY  
Credits: 3  
A study of selected topics from Euclidean and non-Euclidean geometry. Offered in the fall semester of even-number years.  
Pre-Requisites  
MTH-202 or consent of the instructor.

MTH-351. PROBABILITY AND MATHEMATICAL STATISTICS I  
Credits: 3  
Random variables, probability distributions, expectation and limit theorems, introduction to confidence intervals and hypotheses testing. Offered every fall.  
Pre-Requisites  
MTH-112 or consent of the instructor.
MTH-352. PROBABILITY AND MATHEMATICAL STATISTICS II
Credits: 3
Hypothesis testing, non-parametric methods, multivariate distributions, introduction to linear models. Offered in the spring semester of odd-numbered years when demand warrants.

Pre-Requisites
MTH-351 or consent of the instructor.

MTH-354. STATISTICAL METHODOLOGY
Credits: 3
This course emphasizes applications, using statistical computer packages, such as BMDP, SPSS, and JMP, and real data sets from a variety of fields. Topics include estimation and testing, stepwise regression, analysis of variance and covariance, design of experiments, contingency tables, and multivariate techniques, include logistic regression. Offered in the spring semester of even-numbered years when demand warrants.

Pre-Requisites
MTH-150 or MTH-351 or consent of the instructor.

MTH-351. PARTIAL DIFFERENTIAL EQUATIONS
Credits: 3

Pre-Requisites
MTH-211

MTH-352. ADVANCED CALCULUS
Credits: 3
Topics from advanced calculus including matrix representation of differentials and the multivariable chain rule, vector calculus, curvilinear coordinates, tensors, change of variables in higher dimensions, improper multiple integrals, applications of line and surface integrals, differential forms and the general Stokes theorem, potential theory, and Taylor's formula for functions of several variables. Offered Fall of odd years.

Pre-Requisites
MTH-212

MTH-353. OPERATIONS RESEARCH
Credits: 3
A survey of operations research topics such as decision analysis, inventory models, queuing models, dynamic programming, network models and linear programming. Cross-listed with CS-363. Offered in the spring semester of odd-numbered years when demand warrants.

Pre-Requisites
MTH-112 and CS-125.

MTH-364. NUMERICAL ANALYSIS
Credits: 3

Pre-Requisites
MTH-211 and CS-125 (or equivalent programming experience).

MTH-365. NUMERICAL LINEAR ALGEBRA
Credits: 3
Direct and iterative methods for the solution of systems of linear equations, matrix decompositions, computation of eigenvalues and eigenvectors, and relaxation techniques. The theoretical basis for error analysis, including vector and matrix norms. Applications such as least squares and finite difference methods. Offered spring semester of even-numbered years.

Click here for course fee.

Pre-Requisites
MTH-214 and CS-125 (or equivalent programming experience)

MTH-391. SENIOR SEMINAR
Credits: 1
Presentations and discussions of selected topics in mathematics, conducted by students and faculty.

Pre-Requisites
MTH-311 or MTH-331 and senior standing in mathematics.

MTH-392. SENIOR SEMINAR
Credits: 2
Presentations and discussions of selected topics in mathematics, conducted by students and faculty.

Pre-Requisites
MTH-311 or MTH-331 and senior standing in mathematics.

MTH-397. SEMINAR
Credits: 1-3
Presentations and discussions of selected topics.

Pre-Requisites
Approval of the department chairperson.

MTH-399. COOPERATIVE EDUCATION
Credits: 1-6
Professional cooperative education placement in a private or public organization related to the student's academic objectives and career goals. In addition to their work experiences, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student's discipline. See the Cooperative Education section of this bulletin for placement procedures. Requirements: Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson.
MTH-413. FUNCTIONS OF SEVERAL VARIABLES
Credits: 3
A modern treatment of the calculus of functions of several real variables. Topics include Euclidean spaces, differentiation, integration of manifolds leading to the classical theorems of Green and Stokes. Offered when demand warrants.

Pre-Requisites
MTH-214 and MTH-311.

MTH-432. ABSTRACT ALGEBRA II
Credits: 3
A continuation of MTH-331. Polynomial rings, ideals, field extensions, and Galois Theory. Offered when demand warrants.

Pre-Requisites
MTH-331.

MTH-442. TOPOLOGY
Credits: 3
Metric spaces, topological spaces, countability and separation axioms, compactness, connectedness, product spaces. Offered when demand warrants.

Pre-Requisites
MTH-311 or consent of the instructor.

MTH-470. READING COURSE
Credits: 1-3
Requirements: Senior standing in mathematics and approval of the department chairperson.

MTH-999. PRECALCULUS
Credits: 3
A course in advanced algebra and trigonometry designed to prepare students for calculus. Topics include functions, inverse functions, logarithms, exponentials, and trigonometry.

Pre-Requisites
MTH 94 or meet Department of Mathematics and Computer Science placement criteria.