

MATHEMATICS (MATH)

MATHINB Indian Baccalaureate Credit

Offering: **Host**
 Grading: **Transfer**
 Credits: **1.00**
 Gen Ed Area: **None**
 Prereq: **None**

MATH117 Introductory Calculus

This course is designed to introduce basic ideas and techniques of differential calculus. Students should enter with sound precalculus skills but with very limited or no prior study of calculus. Topics to be considered include differential calculus of algebraic, exponential, and logarithmic functions. (Integral calculus will be introduced in MATH118.)

Offering: **Host**
 Grading: **A-F**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **None**

MATH118 Introductory Calculus II: Integration and Its Applications

This course continues MATH117 and is designed to introduce basic ideas and techniques of calculus. Students should enter MATH118 with sound precalculus skills and with very limited or no prior study of integral calculus. Topics to be considered include differential and integral calculus of algebraic, exponential, and logarithmic functions.

Offering: **Host**
 Grading: **A-F**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **None**

MATH119 Elements of Calculus, Part I

This course is the first half of a two-semester calculus sequence (MATH119, MATH120). This sequence is designed for students who have not previously studied calculus. The course, together with MATH120, will cover limits, derivatives, and integrals. Exponential, logarithmic, and trigonometric functions will be introduced and their calculus will be studied. Applications of calculus to biology, economics, physics, and/or other fields will be emphasized.

Offering: **Host**
 Grading: **A-F**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **None**

MATH120 Elements of Calculus, Part II

This course is the second half of a two-semester calculus sequence. This sequence is designed for students who have not previously studied calculus. The course, together with MATH119, will cover limits, derivatives, and integrals. Exponential, logarithmic, and trigonometric functions will be introduced and their calculus will be studied. Applications of calculus to biology, economics, physics, and/or other fields will be emphasized.

Offering: **Host**
 Grading: **A-F**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **MATH119**

MATH121 Calculus I

MATH121, together with MATH122, will cover both theoretical and practical aspects of limits, derivatives, and integrals; the calculus of exponential, logarithmic, trigonometric, and inverse trigonometric functions; techniques

of integration; plane analytic geometry; various applications of calculus; and sequences and series, including power series and intervals of convergence.

Offering: **Host**
 Grading: **A-F**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **None**

MATH122 Calculus II

The continuation of MATH121. Topics covered include techniques and applications of integration and an introduction to sequences and series.

Offering: **Host**
 Grading: **A-F**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **None**

MATH123F Mathematical Deduction with Calculus (FYS)

This course is a first-year seminar (FYS). Topics covered include techniques and applications of integration and an introduction to sequences and series, with an emphasis on mathematical writing. Weekly papers will be required. It is suitable for students who have already taken calculus and are interested in pursuing the mathematics major. Students may not receive credit for both MATH 122 and MATH 123.

Offering: **Host**
 Grading: **OPT**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **MATH121**

MATH132 Elementary Statistics

Topics included in this course are organizing data, central measures, measures of variation, distributions, sampling, estimation, conditional probability (Bayes' theorem), hypothesis testing, simple regression and correlation, and analysis of variation.

Offering: **Host**
 Grading: **A-F**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **None**

MATH133 Intermediate Statistics

This class continues the study of statistics begun in MATH 132. Topics will include experimental design, ANOVA, multiple regression, non-parametric tests, and further topics as time permits. This course is an ideal continuation for students who have taken MATH 132 or who got a 4 or 5 on the AP Statistics exam and who wish to deepen their statistics knowledge.

Offering: **Host**
 Grading: **OPT**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **MATH132**

MATH134F Mathematical Thinking (FYS)

In this course we seek to illustrate for the students that mathematics is an organic way of thinking, with a beauty and elegance of its own, that also includes its essential applications to many concrete physical models. Students will learn the techniques of mathematical writing, as well as take a survey of important mathematical topics.

Offering: **Host**
 Grading: **OPT**
 Credits: **1.00**
 Gen Ed Area: **NSM-MATH**
 Prereq: **None**

MATH211 Problem Solving for the Putnam

This course will explore the problems and problem-solving techniques of the annual William Lowell Putnam mathematical competition. Particular emphasis will be placed on learning to write clear and complete solutions to problems. The competition is open to all undergraduate students.

Offering: **Host**

Grading: **Cr/U**

Credits: **0.25**

Gen Ed Area: **NSM-MATH**

Prereq: **None**

MATH221 Vectors and Matrices

This is a course on the algebra of matrices and vector spaces. It emphasizes a concrete approach to the material. Topics include solving systems of linear equations, vector algebra, matrix algebra, properties of invertible matrices, determinants, the vector space \mathbb{R}^n and its subspaces, dimension, and linear transformations. It concludes with a discussion of eigenvalues, eigenvectors, and matrix diagonalization. If time permits, additional topics such as the dot product, the Gram-Schmidt process, and basic aspects of vector spaces will be discussed.

MATH 221 and MATH 223 cover very similar material, but they are intended for students with different experience in mathematics. MATH 221 takes a more concrete approach to the material, and it is suitable for students who have not yet engaged with proof-based mathematics. MATH 223 takes a more theoretical approach that is appropriate for students who have taken proof-based math courses already or for students with strong mathematics backgrounds who are willing to learn how to read and write proofs in parallel with linear algebra. MATH 221 and MATH 223 fulfill the same requirement for the mathematics major, and students need only select the option that is best suited to their current background in mathematics.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH122**

MATH222 Multivariable Calculus

This course treats the basic aspects of differential and integral calculus of functions of several real variables, with emphasis on the development of calculational skills. The areas covered include scalar- and vector-valued functions of several variables, their derivatives, and their integrals; the nature of extremal values of such functions and methods for calculating these values; and the theorems of Green and Stokes.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **None**

MATH223 Linear Algebra

This is a first course on linear algebra. It emphasizes a theoretical approach to the material. Topics include vector spaces, subspaces, dimension, linear transformations and matrices, determinants, eigenvalues and eigenvectors, and diagonalization of linear operators. If time permits, additional topics such as inner product spaces, Hermitian and unitary transformations, and elementary spectral theory will be discussed.

MATH 221 and MATH 223 cover very similar material--they are both linear algebra courses--but they are intended for students with different experience in mathematics. MATH 223 takes a more theoretical approach that is appropriate for students who have taken proof-based math courses already or for students

with strong mathematics backgrounds who are willing to learn how to read and write proofs in parallel with linear algebra. MATH 221 takes a more concrete approach to the material, and it is suitable for students who have not yet engaged with proof-based mathematics. MATH 221 and MATH 223 fulfill the same requirement for the mathematics major, and students need only select the option that is best suited to their current background in mathematics.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH122**

MATH225 Introduction to Real Analysis

In this rigorous treatment of calculus, topics will include, but are not limited to, real numbers, limits, sequences and series, continuity and uniform continuity, differentiation, the Riemann integral, sequences and series of functions, pointwise and uniform convergence of functions, and interchange of limiting processes. MATH228 or comparable experience in writing mathematical proofs is strongly recommended for success in this course.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **(MATH222 AND MATH221) OR (MATH222 AND MATH223)**

MATH226 Complex Analysis

This course will present the basic properties of complex analytic functions. We begin with the complex numbers themselves and elementary functions and their mapping properties, then discuss Cauchy's integral theorem and Cauchy's integral formula and applications, Taylor and Laurent series, zeros and poles and residue theorems, the argument principle, and Rouche's theorem. In addition to a rigorous introduction to complex analysis, students will gain experience in communicating mathematical ideas and proofs effectively.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **(MATH222 AND MATH221) OR (MATH222 AND MATH223)**

MATH228 Discrete Mathematics

This course is a survey of discrete mathematical processes. Students will be introduced to the process of writing formal mathematical proofs, including mathematical induction. Topics may include set theory, logic, number theory, finite fields, permutations, elementary combinatorics, or graph theory.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **None**

MATH229 Differential Equations

This course is an introduction to the theory of ordinary differential equations. Topics will include existence and uniqueness theorems as well as techniques to solve systems of equations, with applications in pure mathematics and related fields such as physics, chemistry or biology.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **(MATH221 AND MATH222) OR (MATH222 AND MATH223)**

MATH231 An Introduction to Probability

This course teaches the basic theory of probability. Although the notions are simple and the mathematics involved require only a basic knowledge of the ideas of differential and integral calculus, a certain degree of mathematical maturity

is necessary. The fundamental concepts to be studied are probability spaces and random variables, the most important ideas being conditional probability and independence. The main theorems we will study are the law of large numbers and the central limit theorem.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH222 AND MATH228**

MATH232 Mathematical Statistics

This course covers the basic notions of estimation, hypothesis testing, regression, analysis of variance, experimental design, and other topics in statistics from a rigorous mathematical perspective. This material will be supplemented by various case studies.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH231**

MATH233 Stochastic Processes

This course provides a rigorous introduction to the theory of stochastic processes. Topics include a review of basic concepts of probability theory (probability spaces, random variables, expectation), Markov chains, Poisson processes, random walks, and Brownian motion. In tandem, the workshop section taught by the Quantitative Analysis Center (QAC) will provide practical skills in R programming. These workshops are geared towards novices in programming and will detail ways to computationally tackle more complex, real-life stochastic processes. Students entering the course should have completed MATH231, and be comfortable with multivariable calculus and linear algebra.

Offering: **Host**

Grading: **A-F**

Credits: **1.50**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH231**

MATH241 Set Theory

This course covers ordinal and cardinal numbers, cardinal arithmetic, theorems of Cantor and Schroeder-Bernstein, introduction to Zermelo-Fraenkel set theory, Axiom of Choice, and some infinitary combinatorics.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **None**

MATH242 Topology

This course is an introduction to topology, the study of space in a general sense. We will approach topology through knot theory, the study of embeddings of a circle in a 3-dimensional space.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **None**

MATH243 Mathematical Logic

This course is an introduction to mathematical logic, including first-order logic and model theory, axiomatic set theory, and, as time permits, Goedel's incompleteness theorem.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH228**

MATH244 Topology: Point Set

This is an introduction to general topology, the study of topological spaces. We will begin with the most natural examples, metric spaces, and then move on to more general spaces. This subject, fundamental to mathematics, enables us to discuss notions of continuity and approximation in their broadest sense. We will illustrate topology's power by seeing important applications to other areas of mathematics.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH228**

MATH246 Applied Topology

This course teaches the main concepts in Applied Topology. Students will learn to apply nonlinear methods to analyze the shape of data sets. These approaches are drawn from classical topology and focus on the shape in one of two ways: they either 'measure' it, that is count the occurrences of patterns within the data set; or build combinatorial representations of the data set. As an example of the former, we will look at persistent homology, whereas the latter will be represented by mapper. The topics covered include: basic notions from topology, simplicial complexes (Cech complexes, Vietoris-Rips complexes, etc.), homology, persistent homology and applications, mapper.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH223**

MATH252 Differential Forms

This class will be an introduction to differential forms, a central tool in modern topology, geometry, and physics. The course begins where MATH222 ends, with Green's theorem, the divergence theorem, and Stokes' theorem. All of these theorems are special cases of one theorem, known as the general Stokes' theorem, about integration of differential forms. The objective of the first part of the course will be to understand and prove this theorem. We will then discuss manifolds and what can be learned about them using differential forms, concentrating on de Rham cohomology.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **(MATH221 AND MATH222) OR (MATH222 AND MATH223)**

MATH255 Advanced Topics in Real Analysis

Topics to be addressed include convergence of sequences and series of functions, spaces of functions and their topologies, the Lebesgue integral (on the line) and its basic convergence theorems, and Fourier series.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH225**

MATH261 Introduction to Abstract Algebra

This course is an introduction to abstract principles based on the special properties of the integers, rational, real and complex numbers. The course will cover general algebraic structures as well as their quotients and homomorphisms, with emphasis on fundamental results about groups and rings.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **(MATH221 AND MATH228) OR (MATH223 AND MATH228)**

MATH262 Advanced Topics in Abstract Algebra

This second course in abstract algebra will cover fields and polynomial rings, as well as Galois theory and the insolubility of the quintic polynomial. Additional topics will be covered as time permits.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH261**

MATH264 Algebraic Geometry

This course is an introduction to algebraic geometry, the study of the geometric structure of solutions to systems of polynomial equations. These may take the form of lines, circles, parabolas, ellipses, hyperbolas, elliptic curves, lemniscates or Cassini ovals.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH261**

MATH271 Error-Correcting Codes

Nowadays messages are sent electronically through different kinds of communication channels. Most of these channels are not perfect and errors are created during the transmission. The object of an error-correcting code is to encode the data so that the message can be recovered if not too many errors have occurred. The goal of this course is to introduce the basic mathematical ideas behind the design of error-correcting codes. It makes use of algebraic techniques involving vector spaces, finite fields, and polynomial rings. These techniques will be developed in this course so that prior knowledge is not necessary.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH221 OR MATH223**

MATH272 Elementary Number Theory

This is a course in the elements of the theory of numbers. Topics covered include divisibility, congruences, quadratic reciprocity, Diophantine equations, and a brief introduction to algebraic numbers.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH228**

MATH273 Combinatorics

This course will present a broad, comprehensive survey of combinatorics. Topics may include partitions, the topic of inclusion-exclusion, generating functions, recurrence relations, partially ordered sets, trees, graphs, and min-max theorems.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH228**

MATH274 Graph Theory

A graph is a set V of elements called vertices and a set E of pairs of elements of V called edges. From this simple definition, many elegant models have been developed. Indeed, graph theory is essential to applications of computer science to network analysis and planar mapping.

This course will be an introduction to graph theory and its applications.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH228**

MATH283 Differential Geometry

This course is an introduction to the classical differential geometry of curves and surfaces in Euclidean 3-space. Topics from global differential geometry and extensions to higher dimensions will be considered as time and the background of the students permit.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **(MATH222 AND MATH221) OR (MATH222 AND MATH223)**

MATH284 Euclidean and Non-Euclidean Geometry

Euclid developed an axiomatic system to describe plane geometry in 300 BC. This system is fundamental to our understanding of mathematics today. In this course, we will compare and contrast plane geometry and its axiomatic system with several beautiful geometries, including spherical, elliptical and hyperbolic geometries, and their applications.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **NSM-MATH**

Prereq: **MATH222 AND (MATH221 OR MATH223)**

MATH401 Individual Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH402 Individual Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH407 Senior Tutorial (downgraded thesis)

Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor. Only enrolled in through the Honors Coordinator.

Offering: **Host**

Grading: **A-F**

MATH408 Senior Tutorial (downgraded thesis)

Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor. Only enrolled in through the Honors Coordinator.

Offering: **Host**

Grading: **A-F**

MATH409 Senior Thesis Tutorial

Topics to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH410 Senior Thesis Tutorial

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH411 Group Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH412 Group Tutorial, Undergraduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH419 Student Forum

Student-run group tutorial, sponsored by a faculty member and approved by the chair of a department or program.

Offering: **Host**

Grading: **Cr/U**

MATH421 Undergraduate Research, Science

Individual research projects for undergraduate students supervised by faculty members.

Offering: **Host**

Grading: **OPT**

MATH422 Undergraduate Research, Science

Individual research projects for undergraduate students supervised by faculty members.

Offering: **Host**

Grading: **OPT**

MATH423 Advanced Research Seminar, Undergraduate

Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH424 Advanced Research Seminar, Undergraduate

Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH465 Education in the Field, Undergraduate

Students must consult with the department and class dean in advance of undertaking education in the field for approval of the nature of the responsibilities and method of evaluation.

Offering: **Host**

Grading: **OPT**

MATH466 Education in the Field, Undergraduate

Students must consult with the department and class dean in advance of undertaking education in the field for approval of the nature of the responsibilities and method of evaluation.

Offering: **Host**

Grading: **OPT**

MATH469 Education in the Field, Undergraduate

Students must consult with the department and class dean in advance of undertaking education in the field for approval of the nature of the responsibilities and method of evaluation.

Offering: **Host**

Grading: **OPT**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH470 Independent Study, Undergraduate

Credit may be earned for an independent study during a summer or authorized leave of absence provided that (1) plans have been approved in advance, and (2) all specified requirements have been satisfied.

Offering: **Host**

Grading: **OPT**

Credits: **0.50**

Gen Ed Area: **None**

Prereq: **None**

MATH491 Teaching Apprentice Tutorial

The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.

Offering: **Host**

Grading: **OPT**

MATH492 Teaching Apprentice Tutorial

The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.

Offering: **Host**

Grading: **OPT**

MATH495 Research Apprentice, Undergraduate

Project to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **Cr/U**

MATH496 Research Apprentice, Undergraduate

Project to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **Cr/U**

MATH500 Graduate Pedagogy

The elements of good teaching will be discussed and demonstrated through lectures, practice teaching sessions, and discussions of problems encountered in the actual teaching environment. The staff consists of faculty and experienced graduate students. An integral part of the course is a required one-day workshop BEFORE the first day of formal classes.

Training in pedagogy in the first semester of attendance is required for all incoming Wesleyan MA and PhD students who have not already fulfilled this requirement at Wesleyan. BA/MA students are not required to get training in pedagogy but may choose to do so.

Offering: **Crosslisting**

Grading: **Cr/U**

Credits: **0.50**

Gen Ed Area: **None**

Identical With: **ASTR500, CHEM500, BIOL500, E&ES500, MB&B500, MUSC500, PHYS500, PSYC500**

Prereq: **None**

MATH501 Individual Tutorial, Graduate

Topic to be arranged in consultation with tutor.

Offering: **Host**

Grading: **OPT**

MATH502 Individual Tutorial, Graduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH503 Selected Topics, Graduate Sciences

Topic to be arranged in consultation with the tutor. A seminar primarily concerned with papers taken from current research publications designed for, and required of, graduate students.

Offering: **Host**

Grading: **OPT**

MATH504 Selected Topics, Graduate Sciences

Topic to be arranged in consultation with the tutor. A seminar primarily concerned with papers taken from current research publications designed for, and required of, graduate students.

Offering: **Host**

Grading: **OPT**

MATH507 Topics in Combinatorics

Each year the topic will change.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH509 Model Theory

This course will emphasize model theoretic algebra. We will consider the model theory of fields, including algebraically closed, real-closed, and p -adically closed fields; algebraically closed valued fields; and also general questions of definability in fields. As time permits, we will consider more recent applications of model theory in number theory and arithmetic geometry. Ideally, the student should understand what it means to be first-order definable and should have the equivalent of a year's study of abstract algebra. To study various applications, it will be necessary to assume certain results from the areas of application--that is, without proving them ab initio.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH511 Group Tutorial, Graduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH512 Group Tutorial, Graduate

Topic to be arranged in consultation with the tutor.

Offering: **Host**

Grading: **OPT**

MATH513 Analysis I

MATH513 and MATH514 constitute the first-year graduate course in real and complex analysis. One semester will be devoted to real analysis, covering such topics as Lebesgue measure and integration on the line, abstract measure spaces and integrals, product measures, decomposition and differentiation of measures, and elementary functional analysis. One semester will be devoted to complex analysis, covering such topics as analytic functions, power series, Mobius transformations, Cauchy's integral theorem and formula in its general form, classification of singularities, residues, argument principle, maximum modulus principle, Schwarz's lemma, and the Riemann mapping theorem.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH514 Analysis I

MATH513 and MATH514 constitute the first-year graduate course in real analysis, complex analysis and functional analysis. Topics may include power series, Mobius transformations, Cauchy's integral theorem and formula, maximum modulus principle, Schwarz's lemma, Riemann mapping theorem, Lebesgue and other measures, and Fourier transforms.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH515 Analysis II

This is a topics course in analysis and varies from year to year. It may be repeated for credit.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH516 Analysis II

This is a topics course in analysis and varies from year to year. It may be repeated for credit.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **MATH513**

MATH523 Topology I

This course is an introduction to topological spaces and the fundamental group; topological spaces, continuous maps, metric spaces; product and quotient spaces; compactness, connectedness, and separation axioms; and introduction to homotopy and the fundamental group.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH524 Topology I

A continuation of MATH523, this course will be an introduction to algebraic topology, concentrating on the fundamental group and homology.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH525 Topology II: Topics in Topology

This is a topics course in topology that varies from year to year. This course may be repeated for credit. Recent topics have included knot theory, homotopy theory, Lie groups, and topological graph theory.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH526 Topology II

This is a topics course in topology that varies from year to year. It may be repeated for credit.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH543 Algebra I

This course covers group theory including Sylow theorems, and basic ring and module theory, including structure of finitely generated modules over principal-ideal domains.

Offering: **Host**

Grading: **A-F**

Credits: **1.00**

Gen Ed Area: **None**

Prereq: **None**

MATH544 Algebra I

This course studies Galois theory, finitely generated modules over principal-ideal domains, and other topics as time permits.

Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Prereq: **None**

MATH545 Algebra II: Topics in Algebra

This is a topics course in algebra that varies from year to year. This course may be repeated for credit.

Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Prereq: **None**

MATH546 Algebra II

This is a topics course in algebra that varies from year to year. It may be repeated for credit.

Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Prereq: **None**

MATH549 Advanced Research Seminar, Graduate

Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

MATH550 Advanced Research Seminar, Graduate

Advanced research tutorial; project to be arranged in consultation with the tutor.

Offering: **Host**
Grading: **OPT**

MATH572 Special Topics in Mathematics

This is a supervised reading course on advanced topics in number theory. This course may be repeated for credit.

Offering: **Host**
Grading: **A-F**
Credits: **1.00**
Gen Ed Area: **None**
Prereq: **None**