

Mathematics

By learning mathematics, students develop their reasoning abilities and problem-solving skills. Understanding numbers and shapes, formulas and processes, and chances and algorithms sets the foundation for students to succeed in other sciences and to better understand the world around them. The department's implementation of equitable practices helps ensure students' needs as learners are met. Math faculty are devoted to the teaching of mathematics and want to spread their excitement about this mighty discipline to students and the community.

Mathematics, the abstract, deductive study of pattern and structure, is the foundation of all science and technology programs, such as biological, physical, computer, behavioral, and social sciences as well as engineering. Areas of mathematics include arithmetic, algebra, geometry, calculus, and various other theoretical and applied subjects. Students take mathematics courses to prepare for a mathematics major, to meet prerequisites in related disciplines, or to fulfill general education requirements. A bachelor's degree in mathematics can lead to a career in a computer-related field or as an actuary, accountant, mathematician, statistician, or teacher.

Academic and Career Pathway: Math and Sciences

Contact Information

Chair: Leila Safaralian

Dean: Michael Fino

<https://www.miracosta.edu/academics/degree-and-certificate-programs/math-and-sciences/mathematics/index.html>

Department: Mathematics

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Full-Time Faculty

Janeen Apalatea

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Serena Mercado

Shannon Myers

Lemee Nakamura

Zikica Perovic

Beth Powell

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Associate Degrees

Associate of Science Degree

Mathematics for Transfer

Students completing this associate degree will have completed lower-division major preparation requirements for a mathematics degree, an emphasis or option within a mathematics degree, or a degree considered similar to mathematics at a participating California State University (CSU) campus. Following transfer to a participating CSU campus, students will be required to complete no more than 60 units to obtain a bachelor's degree; however, some CSU campuses may require additional lower-division major preparation. This degree may not be appropriate preparation for students transferring to a CSU campus not accepting this degree or

to a university or college that is not part of the CSU system. Students should consult with a MiraCosta counselor for further information regarding the most efficient pathway to transfer as a mathematics major and to determine which CSU campuses are participating in this program.

To complete the degree, students must fulfill the following requirements:

- ▶ Complete a minimum of 60 CSU-transferable semester units.
- ▶ Complete all courses required in the major with a "C" or "P" or better.
- ▶ Complete the CSU-GE (Plan B) or IGETC (Plan C) * general education pattern.
- ▶ Obtain a minimum CSU-transferable GPA of 2.0.
- ▶ Complete a minimum of 12 units in residence at MiraCosta College.

* Students completing IGETC may be awarded the degree, but they must complete a course from Area IC: Oral Communication to meet CSU admission requirements.

Program Student Learning Outcome Statement:

- ▶ Upon successful completion of this program, students will be able to analyze problems, evaluate expressions, and interpret and apply the results.

Required Core:

MATH 150	Calculus and Analytic Geometry I	5
or MATH 150H	Calculus and Analytic Geometry I (Honors)	
MATH 155	Calculus and Analytic Geometry II	4
or MATH 155H	Calculus and Analytic Geometry II (Honors)	
MATH 260	Calculus and Analytic Geometry III	4
or MATH 260H	Calculus and Analytic Geometry III (Honors)	
List A: Select one course.		4
MATH 265	Differential Equations	
or MATH 265H	Differential Equations (Honors)	
MATH 270	Linear Algebra	
or MATH 270H	Linear Algebra (Honors)	
List B: Select one course.		3-5
Any List A course not already used.		
MATH 226	Discrete Mathematics	
or MATH 226H	Discrete Mathematics (Honors)	
MATH 103	Statistics	
or MATH 103S	Statistics with Integrated Support	
CS 111	Introduction to Computer Science I: Java	
CS 150	C++ Programming	
PHYS 151	Principles of Physics I	
or PHYS 151H	Principles of Physics I (Honors)	
Total Units		20-22

NOTE: Students are strongly advised to select courses that meet lower-division major preparation requirements at their transfer university and to complete the History, Constitution, and American Ideals requirement prior to transfer.

Courses

MATH 28: Math Fundamentals I

Units: 4

Prerequisites: None

Lecture 3.50 hours, laboratory 1.50 hours.

Course Typically Offered: Fall, Spring

This course covers the fundamentals of real numbers, pattern recognition and generalization, graphs and functions, basics of exponents, and solving of proportions and equations. It develops the relationship between realistic applications and quantitative reasoning.

MATH 30: Elementary Algebra

Units: 4

Prerequisites: MATH 28 or eligibility determined by the math placement process.

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

Designed to prepare students for intermediate algebra, this course teaches simplifying algebraic expressions involving polynomials and rational terms; factoring; solving linear equations; solving quadratic and rational equations using factoring; analyzing graphs of linear equations; and solving applied problems.

MATH 64: Intermediate Algebra

Units: 4

Prerequisites: MATH 30 or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 64S.

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

This algebra course covers radicals, exponents, concepts of relations and functions, exponential and logarithmic functions, linear and quadratic functions, and the solutions of equations from these topics.

MATH 64S: Intermediate Algebra with Integrated Support

Units: 6

Prerequisites: MATH 30 or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 32 or MATH 64.

Lecture 5 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring, and Summer

This algebra course covers radicals, exponents, concepts of relations and functions, exponential and logarithmic functions, linear and quadratic functions, and the solutions of equations from these topics. It includes just-in-time support for these topics and is intended for students who are eligible for enrollment in MATH 30, Elementary Algebra. Review topics include solving and graphing linear equations and inequalities in one and two variables, solving and graphing systems of equations in two variables, factoring, algebraic operations on polynomial and rational expressions, solving quadratics using factoring, and rational equations and inequalities.

MATH 102: Math Fundamentals: Mathematics for Life

Units: 3

Prerequisites: Elementary algebra or eligibility determined by the math placement process.

Acceptable for Credit: CSU, UC

Lecture 2.50 hours, laboratory 1.50 hours.

Course Typically Offered: Fall, Spring, and Summer

This course covers the fundamentals of logic, including fallacies, inductive and deductive reasoning, conditional statements, and the evaluation of arguments; the basic ideas of finance, including simple and compound interest, amortized loans, and retirement accounts; ideas of probability and applications of probability to realistic situations; and problem solving. The course provides students with a strong foundation in quantitative reasoning and mathematical concepts applicable to everyday life situations and long-term decision-making strategies.

MATH 103: Statistics

Units: 4

Prerequisites: MATH 28 or MATH 30 or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 103S.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

This course introduces the use of probability techniques, hypothesis testing, and predictive techniques to facilitate decision-making. Topics include descriptive statistics; probability and sampling distributions; statistical inference; correlation and linear regression; analysis of variance, chi-square, and t-tests; and application of technology for statistical analysis, including the interpretation of the relevance of statistical findings. Students use appropriate statistical techniques to analyze and interpret applications based on data from a broad range of disciplines. UC CREDIT LIMITATION: Credit for BTEC 180/BTEC 180H, BUS 204/BUS 204H, MATH 103/MATH 103S, PSYC 104/PSYC 104H, or SOC 125. Some CSU campuses may also impose this credit limitation.

MATH 103S: Statistics with Integrated Support

Units: 5

Prerequisites: MATH 28 or MATH 30 or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 103.

Acceptable for Credit: CSU, UC

Lecture 4.50 hours, laboratory 1.50 hours.

Course Typically Offered: Fall, Spring, and Summer

This course introduces the use of probability techniques, hypothesis testing, and predictive techniques to facilitate decision-making. Topics include descriptive statistics; probability and sampling distributions; statistical inference; correlation and linear regression; analysis of variance, chi-square, and t-tests; and application of technology for statistical analysis, including the interpretation of the relevance of statistical findings. Students use appropriate statistical techniques to analyze and interpret applications based on data from a broad range of disciplines. The course includes just-in-time support for these topics. UC CREDIT LIMITATION: Credit for BTEC 180/BTEC 180H, BUS 204/BUS 204H, MATH 103/MATH 103S, PSYC 104/PSYC 104H, or SOC 125. Some CSU campuses may also impose this credit limitation.

MATH 105: Concepts and Structures of Elementary Mathematics I

Units: 3

Prerequisites: MATH 64, MATH 64S, or eligibility determined by the math placement process.

Acceptable for Credit: CSU, UC

Lecture 2 hours, laboratory 3 hours.

Course Typically Offered: Fall, Spring

This course covers set theory, problem solving, systems of numeration, elementary number theory, numerical operations, and arithmetic algorithms. It emphasizes cognitive learning and the development of problem solving strategies and techniques. Students work collaboratively in groups and/or independently using manipulatives and models to explore structures and formulate concepts. It is required for students working toward a multiple subject credential in elementary education. UC CREDIT LIMITATION: Credit for MATH 105 or MATH 106.

MATH 106: Concepts and Structures of Elementary Mathematics II

Units: 3

Prerequisites: MATH 105.

Acceptable for Credit: CSU, UC

Lecture 2 hours, laboratory 3 hours.

Course Typically Offered: Spring

This continuation of MATH 105 covers the mathematical concepts needed for teaching elementary school mathematics. Core topics include the real number system, geometry, Pythagorean theorem, measurement in both the English and metric systems, transformations, and symmetry. Students must demonstrate their understanding of the concepts and structures of elementary mathematics using critical thinking. UC CREDIT LIMITATION: Credit for MATH 105 or MATH 106.

MATH 112: Algebraic Concepts for Problem Solving

Units: 3

Prerequisites: MATH 64, MATH 64S, or eligibility determined by the math placement process.

Acceptable for Credit: CSU, UC

Lecture 3 hours.

Course Typically Offered: Fall, Spring, and Summer

This course uses algebraic concepts to solve applied problems. It addresses application problems that incorporate linear, quadratic, polynomial, rational, exponential, and logarithmic functions. The course covers some applied modeling, including break even analysis, market equilibrium, linear modeling, and exponential growth, decay, and their models. The course also addresses mathematical topics such as optimization, rates of change, and linear systems.

MATH 115: Calculus with Applications

Units: 5

Prerequisites: MATH 64, MATH 64S, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 115S.

Acceptable for Credit: CSU, UC

Lecture 5 hours.

Course Typically Offered: Fall, Spring, and Summer

This course relates calculus to real-world applications in social science, economics, and business. Topics include an extensive and just-in-time algebra review, graphing, limits, derivatives of polynomials of one variable, maxima and minima, integration, derivatives of logarithmic and exponential functions, development of integration techniques, an introduction to multi-variable calculus, and their application to problems. This course is designed primarily for students majoring in social science, economics, and business who require calculus and is not recommended for mathematics, physical science, engineering, or biological science majors. UC CREDIT LIMITATION: Credit for MATH 115, MATH 115S, MATH 150, or MATH 150H. C-ID MATH-140.

MATH 126: Pre-Calculus I: College Algebra

Units: 4

Prerequisites: MATH 64, MATH 64S, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 126S.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

This course covers advanced algebra topics including functions and their properties. Topics include linear, quadratic, polynomial, rational, exponential, and logarithmic functions and their applications, graphs of functions, inverse functions, and systems of equations and inequalities. UC CREDIT LIMITATION: MATH 126 and MATH 131 combined, maximum credit, 5 units.

MATH 126S: Pre-Calculus I: College Algebra with Integrated Support

Units: 5

Prerequisites: MATH 64, MATH 64S, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 126.

Acceptable for Credit: CSU, UC

Lecture 5 hours.

Course Typically Offered: Fall, Spring, and Summer

This course covers advanced algebra topics including functions and their properties. Topics include one unit of intermediate algebra review, linear, quadratic, polynomial, rational, exponential, and logarithmic functions and their applications, graphs of functions, inverse functions, and systems of equations and inequalities.

MATH 131: Pre-Calculus II: Trigonometry and Analytic Geometry

Units: 4

Prerequisites: MATH 126, MATH 126S, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 131H.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

This course covers basic concepts of analytic geometry and trigonometry, including definitions and properties of trigonometric functions. Topics include solutions of applied problems involving right triangles; graphs of trigonometric functions; trigonometric identities; trigonometric equation solving; evaluation of inverse trigonometric functions, polar coordinates, and vectors. The course also covers conics, systems of non-linear equations, and sequences and series. UC CREDIT LIMITATION: MATH 126 and MATH 131/MATH 131H combined, maximum credit 5 units.

MATH 131H: Pre-Calculus II: Trigonometry and Analytic Geometry (Honors)

Units: 4

Prerequisites: MATH 126, MATH 126S, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 131.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring

This course covers basic concepts of analytic geometry and trigonometry, including definitions and properties of trigonometric functions. Topics include solutions of applied problems involving right triangles; graphs of trigonometric functions; trigonometric identities; trigonometric equation solving; evaluation of inverse trigonometric functions, polar coordinates, and vectors. The course also covers conics, systems of non-linear equations, and sequences and series. The course provides mathematically talented students the opportunity to obtain a level of rigor above the level currently available in existing courses. It emphasizes logical reasoning, problem solving, and applications. UC CREDIT LIMITATION: MATH 126 and MATH 131/MATH 131H combined, maximum credit 5 units.

MATH 150: Calculus and Analytic Geometry I

Units: 5

Prerequisites: MATH 131, MATH 131H, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 150H.

Acceptable for Credit: CSU, UC

Lecture 5 hours.

Course Typically Offered: Fall, Spring, and Summer

This course is the first in a three-semester calculus sequence designed for mathematics, science, and engineering majors. Topics include limits and continuity; differentiation of algebraic functions and their inverses, trigonometric functions and their inverses, and exponential functions and their inverses; integration and the fundamental theorem of calculus; and applications of differentiation and integration. UC CREDIT LIMITATION: Credit for MATH 115, MATH 115S, MATH 150, or MATH 150H. C-ID MATH-211.

MATH 150H: Calculus and Analytic Geometry I (Honors)

Units: 5

Prerequisites: MATH 131, MATH 131H, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 150.

Acceptable for Credit: CSU, UC

Lecture 5 hours.

Course Typically Offered: Fall or Spring

This first in a three-semester calculus sequence is designed for highly motivated mathematics, science, and engineering majors. Topics include limits and continuity; differentiation of algebraic functions and their inverses, trigonometric functions and their inverses, and exponential functions and their inverses; integration and the fundamental theorem of calculus; and applications of differentiation and integration. The course provides mathematically talented students the opportunity to obtain a level of rigor above the level currently available in existing courses. It emphasizes logical reasoning, problem solving, and applications. UC CREDIT LIMITATION: Credit for MATH 115, MATH 115S, MATH 150, or MATH 150H. C-ID MATH-211.

MATH 155: Calculus and Analytic Geometry II

Units: 4

Prerequisites: MATH 150 or MATH 150H.

Enrollment Limitation: Not open to students with prior credit in MATH 155H.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

This second course in a three-semester calculus sequence covers advanced integration techniques, improper integrals, infinite sequences and series, conic sections, parametric equations, polar coordinates, and applications of integration. The course is designed for mathematics, science, and engineering majors. UC CREDIT LIMITATION: Credit for MATH 155 or MATH 155H.

MATH 155H: Calculus and Analytic Geometry II (Honors)

Units: 4

Prerequisites: MATH 150 or MATH 150H.

Enrollment Limitation: Not open to students with prior credit in MATH 155.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

This second course in a three-semester calculus sequence covers advanced integration techniques, improper integrals, infinite sequences and series, conic sections, parametric equations, polar coordinates, and applications of integration. The course is designed for mathematics, science, and engineering majors. The course provides mathematically talented students the opportunity to obtain a level of rigor above the level currently available in existing courses. It emphasizes logical reasoning, problem solving, and applications. UC CREDIT LIMITATION: Credit for MATH 155 or MATH 155H.

MATH 226: Discrete Mathematics

Units: 4

Prerequisites: MATH 150, MATH 150H, CS 150, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 226H.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring

Designed for students majoring in mathematics or computer science, this course introduces discrete mathematics, including logic, methods of proof, number theory, sets, counting, discrete probability, relations, recursion, recurrence relations, Boolean algebra, graphs, trees, and networks. Topics are illustrated with applications to computer science, including design and analysis of algorithms, undecidability, program correctness, and digital logic design. UC Credit Limitation: Credit for MATH 226 or MATH 226H.

MATH 226H: Discrete Mathematics (Honors)

Units: 4

Prerequisites: MATH 150, MATH 150H, CS 150, or eligibility determined by the math placement process.

Enrollment Limitation: Not open to students with prior credit in MATH 226H.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring

Designed for students majoring in mathematics or computer science, this course introduces discrete mathematics, including logic, methods of proof, number theory, sets, counting, discrete probability, relations, recursion, recurrence relations, Boolean algebras, graphs, trees, and networks. As an honors course, it offers an enriched experience for highly motivated students to analyze applications of formal logic to mathematics, other sciences, and everyday life. Topics are illustrated with applications to computer science, including design and analysis of complexity of algorithms, undecidability, program correctness, and digital logic design. UC Credit Limitation: Credit for MATH 226 or MATH 226H.

MATH 260: Calculus and Analytic Geometry III

Units: 4

Prerequisites: MATH 155 or MATH 155H.

Enrollment Limitation: Not open to students with prior credit in MATH 260H.

Acceptable for Credit: CSU, UC

Lecture 3.50 hours, laboratory 1.50 hours.

Course Typically Offered: Fall, Spring, and Summer

This third course in a three-semester calculus sequence covers vectors in two- and three-dimensional space, quadratic surfaces, vector-valued functions of several variables, partial differentiation and multiple integration, vector fields, line integrals, and conservative fields. The course is designed for mathematics, science, and engineering majors. UC CREDIT LIMITATION: Credit for MATH 260 or MATH 260H. C-ID MATH-230.

MATH 260H: Calculus and Analytic Geometry III (Honors)

Units: 4

Prerequisites: MATH 155 or MATH 155H.

Enrollment Limitation: Not open to students with prior credit in MATH 260.

Acceptable for Credit: CSU, UC

Lecture 3.50 hours, laboratory 1.50 hours.

Course Typically Offered: Fall, Spring, and Summer

This third course in a three-semester calculus sequence offers an enriched experience for highly motivated students. It covers vectors in the plane and three-dimensional space, quadratic surfaces, vector-valued functions, functions of several variables, partial differentiation and multiple integration, vector fields, and line integrals. The course is designed for mathematics, science, and engineering majors and for students interested in a thorough analysis of concepts, proofs of main results, and connections with other disciplines, particularly probability, physics, and economics. UC CREDIT LIMITATION: Credit for MATH 260 or MATH 260H. C-ID MATH-230.

MATH 265: Differential Equations

Units: 4

Prerequisites: MATH 155 or MATH 155H.

Enrollment Limitation: Not open to students with prior credit in MATH 265H.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring

This course introduces the theory and applications of ordinary differential equations of first and higher (mostly second) order as well as systems of linear differential equations. It includes both quantitative and qualitative methods. The course deals with theoretical aspects of existence and uniqueness of solutions as well as techniques for finding solutions using analytical, numerical, method of power-series, and Laplace transformations. UC CREDIT LIMITATION: Credit for MATH 265 or MATH 265H. C-ID MATH-240.

MATH 265H: Differential Equations (Honors)

Units: 4

Prerequisites: MATH 155 or MATH 155H.

Enrollment Limitation: Not open to students with prior credit in MATH 265.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring, and Summer

This course introduces the theory and applications of ordinary differential equations of first and higher (mostly second) order as well as systems of linear differential equations. It includes both quantitative and qualitative methods. The course deals with theoretical aspects of existence and uniqueness of solutions as well as techniques for finding solutions using analytical, numerical, method of power-series, and Laplace transformations. The course provides mathematically talented students the opportunity to obtain a level of rigor above the level currently available in existing courses. It emphasizes logical reasoning, problem solving, and applications. UC CREDIT LIMITATION: Credit for MATH 265 or MATH 265H.

MATH 270: Linear Algebra

Units: 4

Prerequisites: MATH 155 or MATH 155H.

Enrollment Limitation: Not open to students with prior credit in MATH 270H.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring

This course introduces students to the concepts of linear algebra. Topics include matrix algebra, Gaussian elimination, determinants of a matrix, properties of determinants, vector spaces and their properties with an introduction to proofs, linear transformations, orthogonality, eigenvalues and eigenvectors, and computational methods. UC CREDIT LIMITATION: Credit for MATH 270 or MATH 270H. C-ID MATH-250.

MATH 270H: Linear Algebra (Honors)

Units: 4

Prerequisites: MATH 155 or MATH 155H.

Enrollment Limitation: Not open to students with prior credit in MATH 270.

Acceptable for Credit: CSU, UC

Lecture 4 hours.

Course Typically Offered: Fall, Spring

This course introduces students to the concepts of linear algebra. Topics include matrix algebra, Gaussian elimination, determinants of a matrix, properties of determinants, vector spaces and their properties with an introduction to proofs, linear transformations, orthogonality, eigenvalues and eigenvectors, and computational methods. The course provides mathematically talented students the opportunity to obtain a level of rigor above the level currently available in existing courses. It emphasizes logical reasoning, problem solving, and applications. UC CREDIT LIMITATION: Credit for MATH 270 or MATH 270H.

MATH 292: Internship Studies

Units: 0.5-3

Prerequisites: None

Corequisite: Complete 75 hrs paid or 60 hrs non-paid work per unit.

Enrollment Limitation: Instructor, dept chair, and Career Center approval. May not enroll in any combination of cooperative work experience and/or internship studies concurrently.

Acceptable for Credit: CSU

Course Typically Offered: To be arranged

This course provides students the opportunity to apply the theories and techniques of their discipline in an internship position in a professional setting under the instruction of a faculty-mentor and site supervisor. It introduces students to aspects of the roles and responsibilities of professionals employed in the field of study. Topics include goal-setting, employability skills development, and examination of the world of work as it relates to the student's career plans. Students must develop new learning objectives and/or intern at a new site upon each repetition. Students may not earn more than 16 units in any combination of cooperative work experience (general or occupational) and/or internship studies during community college attendance.

MATH 296: Topics in Mathematics

Units: 1-4

Prerequisites: None

Acceptable for Credit: CSU

Lecture 1 hour.

Lecture 2 hours.

Lecture 3 hours.

Lecture 4 hours.

Course Typically Offered: To be arranged

This course gives students an opportunity to study topics in Mathematics that are not included in regular course offerings. Each Topics course is announced, described, and given its own title and 296 number designation in the class schedule.