

# MATHEMATICS (MA)

## MA 1200 Elementary Algebra (4)

Designed to help students improve their algebra skills. Topics include: review of operations with integers and rational numbers, first and second degree equations, polynomials and factoring, graphing, exponents and radicals, applied word problems, and the quadratic formula. Required for students who have not satisfied the Preliminary Mathematics Requirement. Does not satisfy Mathematics Foundation or any General Education requirements. Falls.

Prerequisite(s): provisionally admitted students or permission of the Department Chair.

## MA 1500 Mathematics and the Humanities (3)

For liberal arts majors and others interested in the relationships of mathematics to fields such as Art, Music and Philosophy. Falls and Springs. (QRCO)

Prerequisite(s): regular admission to Plymouth.

## MA 1800 College Algebra (3)

After reviewing concepts related to properties of real numbers, exponents, polynomial expressions, and coordinate geometry, focuses largely on the study of equations, graphs, and functions. Emphasizes terminology, lines, solving a variety of equations, and reading and transforming graphs. Intended for students whose majors require calculus or applied calculus and were not placed into a higher level mathematics course by the Placement Assessment or AP credit. Falls and Springs.

Prerequisite(s): regular admission to Plymouth.

## MA 1900 Statistical Literacy in Today's Society (3)

Learn to interpret and evaluate reports in the media on studies of substance dependency, medical issues and other socio-cultural concerns. The goal is to learn to understand the statistics encountered in the news or in everyday life rather than to learn specific statistical techniques. Falls and Springs. (QRCO)

Prerequisite(s): regular admission to Plymouth.

## MA 2110 Mathematics for PreK-Grade 3 Educators (4)

A mathematics course for those pursuing majors in Early Childhood Studies and Elementary Education. The instruction format emphasizes activity-based learning, problem-solving, cooperative learning, and communication. Students study mathematics foundational to teaching mathematics at the K-6 level including topics from numbers, arithmetic operations, number theory, fractions, rational numbers, ratios, percentages, and proportions. Students are asked to reason inductively, deductively, and by using analogies. Students solve problems which require creative thought in addition to recollection of facts. Falls and Springs.

Prerequisite(s): regular admission to Plymouth.

## MA 2120 Mathematics for Grades 4-6 Educators (4)

A mathematics course for those pursuing majors in Childhood Studies or Elementary Education. The instruction format emphasizes activity-based learning, problem-solving, cooperative learning, and communication. Students study mathematics foundational to teaching mathematics at the K-8 level including topics from algebra, 2-dimensional and 3-dimensional geometric figures, statistics, and probability. Students are asked to reason inductively, deductively, and by using analogies. Students solve problems which require creative thought and not just regurgitation or application of ideas. Not open to students who have earned credit for MA 3010. Falls and Springs. (QRCO)

Prerequisite(s): MA 2110.

## MA 2130 Precalculus (4)

With the concept of functions as a central theme, considers topics from algebra, trigonometry, and complex numbers including graphing and graph transformations, polynomials and rational functions, the unit circle and its applications, and transformations of trigonometric functions. Places a strong emphasis on the dual representations of functions as equations and graphs. Falls and Springs. (QRCO)

Prerequisite(s): MA 1800, or score Level 2 or higher on the Mathematics Placement Assessment.

## MA 2210 Finite Math with Business Statistics (4)

Uses basic algebra, probability, and statistics to solve problems. Study of algebra includes matrices and linear programming, with applications of input-output models and the Simplex method. Study of probability includes counting techniques with applications of Bayes' Theorem. Study of statistics includes interpretation of numerical and graphical summaries of data, linear regression and correlation, confidence intervals and hypothesis tests. Springs and Falls. (QRCO)

## MA 2300 Statistics I (3)

An introduction to statistics with applications in several disciplines such as Business, Psychology, Education, Social Sciences or Natural Sciences. Included are both descriptive and inferential statistics. Among the topics are numerical and graphical summaries for 1 and 2 variables, linear regression and correlation, confidence intervals and tests concerning means. A standard statistical software package is used throughout the course. Falls and Springs. (QRCO)

Prerequisite(s): regular admission to Plymouth.

## MA 2450 Mathematical Reasoning (4)

Sets and logic form the basic building blocks of mathematics. Students explore set theory, symbolic logic, basic proof writing, counting methods, relations, and functions. Students gain content and communication tools to succeed in mathematical studies and occupations. Critical thinking, collaborative learning, and presentations are emphasized. Students with credit for MA 2400 or MA 2250 may not earn credit for MA 2450. Falls.

Prerequisite(s): MA 1800 or Level 2 of the Math Placement Assessment or higher.

## MA 2550 Calculus I (4)

A first calculus course concentrating on limits, continuity, the derivative, integration, various techniques to differentiate and integrate numerous functions including transcendental functions, applications of the Mean Value Theorem, the First and Second Derivative Tests, and the Fundamental Theorem of Calculus in both theoretical problems and applications. Includes presentations of proofs for select theorems. Students may not receive credit for both MA 2490 and MA 2550. Falls and Springs. (QRCO)

Prerequisite(s): MA 2130 or MA 2140 or Level 4 on the Math Placement Assessment.

## MA 2560 Calculus II (4)

A continuation of calculus with an emphasis on rigor and derivations including further study of integration techniques, applications of integrations, improper integrals, infinite series and proofs of their convergence or divergence, Taylor's Theorem, separable differential equations, and first order linear differential equations. Students with previous credit for MA 2490-2500 may not receive credit for MA 2560. Falls and Springs. (QRCO)

Prerequisite(s): MA 2550.

**MA 2700 Introduction to Mathematical Proof Writing (3)**

Formal logic and mathematics writing conventions are used to write rigorous proofs of mathematical statements in prose. Concepts from a variety of mathematical areas like number theory, analysis, and group theory may be covered. Writing skills are stressed and use of LaTeX is required. Students are expected to produce a portfolio of their work. Springs. (WRCO)

Prerequisite(s): MA 2130 and MA 2400 or MA 2450.

**MA 3130 Directed Research in Mathematics (1-3)**

Under the supervision of a Mathematics Department faculty member, students engage in a research project. Duties typically include, but are not limited to, data collection and analysis, library research, and other prepublication tasks. Students are required to present findings. May be repeated for a maximum of 6 credits. Falls and Springs.

Prerequisite(s): permission of the supervising faculty and the Department Chair.

**MA 3280 Regression Analysis (3)**

Model building using multiple linear regression. Includes applications to categorical data and the analysis of variance. Statistical software is used extensively. Spring of odd years.

Prerequisite(s): MA 2300 or MA 3500 or (CJ/MA 2350).

**MA 3355 Introduction to Mathematical Modeling (4)**

A first course in mathematical modeling on the use of dynamical systems and stochasticity to represent real-world processes. Emphasis is placed on development and refinement. The course is project-based and students will be expected to complete a long-term project. Multiple software packages are used at the discretion of the instructor. (TECO)

Prerequisite(s): MA 2500 or MA 2560, or permission of the instructor.

**MA 3500 Probability and Statistics for Scientists (3)**

A first course in applied probability and statistics for scientists. Emphasizes developing probability concepts and statistical problem solving skills useful in an array of scientific disciplines, as well as providing a foundation for more advanced study. A standard statistical/mathematical software package is used. Falls.

Prerequisite(s): MA 2490 or MA 2550.

**MA 3540 Calculus III (4)**

A continuation of the calculus with an emphasis on rigor and derivations. Topics include three-dimensional coordinate geometry of curves and surfaces; partial and directional derivatives and their applications; double integrals in rectangular coordinates and Fubini's Theorem; triple integrals in rectangular, cylindrical, and spherical coordinates; divergence and curl, and Stoke's Theorem and the Divergence Theorem. Springs.

Prerequisite(s): MA 2560.

**MA 3600 Differential Equations with Linear Algebra (4)**

Combines the major topics of differential equations and linear algebra. This includes techniques for solving first and second order differential equations with applications and matrices, determinants, vectors spaces, and linear transformations. Falls.

Prerequisite(s): MA 2560

**MA 4110 Mathematical Expositions (3)**

Designed to introduce students to the methodology of mathematical research. Students will develop their own definitions, examples, conjectures, and proofs using theory from previous courses. Emphasis is placed on writing and presentations. Students will be expected to produce a portfolio and a poster showcasing their results. May be taken twice. Springs.

Prerequisite(s): MA 2700, and MA 2500 or MA 2560.

**MA 4140 Abstract Algebra (3)**

Studies groups, rings, fields, and selected topics. Spring of even years. (WRCO)

Prerequisite(s): MA 2700; and MA 3120 (may be taken concurrently).

**MA 4220 Topics in Mathematics (3)**

Studies a topic, such as topology, number theory, or complex variables. Course may be repeated for credit, provided a different topic is studied. Spring of odd years.

Prerequisite(s): variable, depending on topic selected; consult course instructor.

**MA 4350 Probability Theory (3)**

Topics in probability theory such as probability spaces, random variables, multivariate distributions and the algebra of expectations as a mathematical foundation for statistical inference. Spring of even years.

Prerequisite(s): (MA 2300 or MA 3500 or CJ/MA 2350) and MA 3540.

**MA 4510 Introduction to Analysis (3)**

A rigorous treatment of the classic topics of analysis including the Completeness Axiom, convergence of sequences, the Balzano-Weierstrauss Theorem, and the formal definitions and applications of a limit of a function, the continuity of a function, open and closed sets, and differentiation. Falls of even years.

Prerequisite(s): MA 2560 and MA 2700.

**MA 4910 Independent Study (1-4)**

An individual study project intended to investigate topics beyond current offerings in the Mathematics Department. Consent required of the instructor who will supervise the Independent Study and the Department Chair.

**MA 4966 Internship in Mathematics Teaching (5-8) (12)**

The culminating field-based experience leading to teacher certification. It is a continuous, full-time (5 days per week) experience. Interns gradually assume responsibility for a full range of teaching activities encountered in a school situation, thereby demonstrating appropriate professional skills and attitudes essential for successful teaching. The internship is conducted under the supervisory guidance of a mentor teacher and a university supervisor. Required seminars complement the experience. Not open to students who have earned credit for MA 4970. Pass/No Pass. Falls.

Prerequisite(s): minimum grade of C in MA 4040; Math majors only; minimum 2.50 cumulative GPA; completion of all other program requirements for certification by the beginning of the Internship in Mathematics Teaching semester; permission of the Coordinator of Internships.

Corequisite(s): MA 4986.

**MA 4976 Internship in Mathematics Teaching (7-12) (12)**

The culminating field-based experience leading to teacher certification. It is a continuous, full-time (5 days per week) experience of 12 credits during which, after a period of structured observation, students gradually assume responsibility for a full range of teaching activities encountered in a school situation, thereby demonstrating the appropriate professional skills and attitudes essential for successful teaching. The internship is conducted under the supervisory guidance of a mentor teacher and a university supervisor. Required seminars complement the experience. Math majors must receive a grade of C or better in all MA courses required in their degree program. Not open to students who have earned credit for MA 4960. Pass/No Pass. Falls.

Prerequisite(s): minimum grade of C in MA 4040; Math majors only; minimum 2.50 cumulative GPA; completion of all other program requirements for certification by the beginning of the Internship in Mathematics Teaching semester; permission of the Coordinator of Internships.

Corequisite(s): MA 4986.

**MA 4986 Internship in Mathematics Teaching Seminar (1)**

Taken concurrently with Internship in Mathematics Teaching and intended to act as a capstone experience in the Mathematics 5-8 and 7-12 Teacher Certification programs. Students participate in both face-to-face and web-based discussions. Focuses on theory in practice; establishes a professional learning community for reflection, dialogue, and inquiry; assists pre-service teachers in their transition into the profession. Pass/No Pass. Falls.

Prerequisite(s): minimum grade of C in MA 4040.

Corequisite(s): MA 4966 or MA 4976