**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. (QRCO)
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 2140 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) (TECO)
Prerequisite(s): MA 1800, or score Level 2 or higher on the Mathematics Placement Assessment.

**MA 2200 Finite Mathematics (3)**
Using algebra to solve analytical problems. Includes work with matrices, linear programming, counting techniques, probability, expected value and Bayes’ Theorem. Falls and Springs. (QRCO)
Prerequisite(s): regular admission to Plymouth.

**MA 2250 Mathematics for Computer Scientists (3)**
A course in basic discrete mathematics intended for Computer Science and Information Technology majors. Topics include sets, logic and logical statements, sequences, counting, relations and functions, common proof techniques, and graph theory. Open to Computer Science and Information Technology majors only. Not open to students who have earned credit for MA 2400. Falls.
Prerequisite(s): MA 1800 or higher or Level 2 on the Math Placement Assessment.

**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 2400 Introduction to Formal Mathematics (3)**
Mathematics for majors is more advanced and abstract than high school mathematics. Introduces new majors and students interested in the study of mathematics to formal mathematics, focusing mostly on sets and logic. Emphasizes collaborative learning and the Mathematics Department culture. Not open to students who have earned credit for MA 2000. Falls.
Prerequisite(s): regular admission to Plymouth.

**MA 2490 Applied Calculus I (4)**
The first semester of a calculus sequence dealing with applications of the differential and integral calculus to other disciplines. Topics include functions and their graphs, limits, continuity, the derivative and its uses in optimization and mathematical modeling, and the Fundamental Theorem. Graphing calculators are used. Students may not receive credit for both MA 2490 and MA 2550. Falls and Springs. (QRCO)
Prerequisite(s): MA 2140, or score Level 3 or higher on the Mathematics Placement Assessment.

**MA 2500 Applied Calculus II (4)**
The second semester of a calculus sequence dealing with applications of the differential and integral calculus to other disciplines. Topics include calculus of transcendental functions, applications of integration, separable differential equations, multidimensional calculus with applications, sequences and series, and integration of trigonometric functions. Graphing calculators are used. Students may not receive credit for both MA 2500 and MA 2560. Springs. (QRCO)
Prerequisite(s): MA 2490.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisite(s)</th>
<th>Description</th>
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<tbody>
<tr>
<td>MA 2550</td>
<td>Calculus I (4)</td>
<td></td>
<td>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. (QR)</td>
</tr>
<tr>
<td>MA 2560</td>
<td>Calculus II (4)</td>
<td>Prerequisite(s): MA 2140, or score Level 4 on the Mathematics Placement Assessment.</td>
<td>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. (QR)</td>
</tr>
<tr>
<td>MA 2700</td>
<td>Logic, Proofs, and Axiomatic Systems (3)</td>
<td></td>
<td>The study of formal logic is used to write rigorous proofs of mathematical statements. Concepts from set theory, relations, number theory, analysis, complex numbers, linear algebra, graph theory, and abstract algebra may be included. The variety of settings may vary each semester. Stresses development of proofs writing skills and includes techniques like direct proof, proof by contradictions, and induction. Students are expected to produce a portfolio of their work. Not open to students who have earned credit for MA 3110. Springs. (WRC)</td>
</tr>
<tr>
<td>MA 2600</td>
<td>Math Activities Center Practicum (1)</td>
<td>Prerequisite(s): MA 2490 or MA 2550.</td>
<td>Students examine recent research relating to the teaching of mathematics which they apply while tutoring students in the Math Activities Center. Weekly meetings are held. Falls and Springs. (QR)</td>
</tr>
<tr>
<td>MA 3050</td>
<td>Introduction to Mathematics Education (3)</td>
<td></td>
<td>Studies the history of the standards movement in mathematics education and current state and national standards. Introduces local, regional, and national organizations of mathematics teachers. Students use and write lesson plans that focus on outcomes that drive instruction and include links to standards, measurable outcomes, classroom activities, and formative and summative assessments. Considers assessment on classroom, state-wide, national, and international levels. Requires 20 hours of school-based classroom observation and participation. Open to Mathematics Education majors and minors. Not open to students who have earned credit for MA 3080. Springs. (WRC)</td>
</tr>
<tr>
<td>MA 3130</td>
<td>Directed Research in Mathematics (1-3)</td>
<td>Prerequisite(s): permission of the supervising faculty and the Department Chair.</td>
<td>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. (QR)</td>
</tr>
<tr>
<td>MA 3200</td>
<td>Discrete Mathematics (3)</td>
<td>Prerequisite(s): MA 2400 or 1 semester of calculus.</td>
<td>An introduction to Discrete Mathematics including topics in Boolean Algebra, Mathematical Induction, Recursion Relations, Algorithms and Graph Theory. Falls and Springs. (QR)</td>
</tr>
<tr>
<td>MA 3230</td>
<td>College Geometries (4)</td>
<td></td>
<td>Rigorous study of Euclidean geometry, with an emphasis on proofs. Non-Euclidean geometries are also rigorously studied as they compare to Euclidean geometry. Explores theorems and constructions using geometry software. Falls of even years. (TEC) (WRC)</td>
</tr>
<tr>
<td>MA 3280</td>
<td>Regression Analysis (3)</td>
<td></td>
<td>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. (QR)</td>
</tr>
<tr>
<td>MA 3355</td>
<td>Introduction to Mathematical Modeling (4)</td>
<td></td>
<td>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. (TEC) (WRC)</td>
</tr>
<tr>
<td>MA 3460</td>
<td>History of Mathematics (3)</td>
<td></td>
<td>A historical background in the areas of mathematics needed to understand its logical and sequential nature, its contributions to the growth of both Eastern and Western cultures, and the development of a global discipline. Springs Odd. (GACO) (WRC)</td>
</tr>
<tr>
<td>MA 3500</td>
<td>Probability and Statistics for Scientists (3)</td>
<td></td>
<td>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. (QR)</td>
</tr>
<tr>
<td>MA 3510</td>
<td>Differential Equations (3)</td>
<td></td>
<td>Discusses basic concepts, techniques of solution and applications of ordinary first and second order differential equations and series solutions. Falls. (QR)</td>
</tr>
<tr>
<td>MA 3540</td>
<td>Calculus III (4)</td>
<td></td>
<td>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. (QR)</td>
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</tbody>
</table>

**Mathematics (MA)**
MA 4020 The Cultural and Psychological Aspects of Mathematics Learning (3)
Focuses on the cultural and psychological aspects of learning mathematics including implications of Piaget's research, constructivist learning theories, attitudes, teaching exceptional children, brain research and brain hemispheric specialization, mathematics education in foreign countries, mathematics anxiety, tracking, contrasting developmentalists verses behaviorists theories of learning, mathematics assessment, evaluation and selection of curriculum materials. TIMSS results and their implications and how culture influences education. Students spend a minimum of 12 hours in schools observing and working with students and teachers. Math majors must receive a grade of C or better in all MA courses required in their degree program. Falls. (DICO) (INCO) (INCP)
Prerequisite(s): MA 3050 and Junior status; Teacher Certification majors only.

MA 4040 Teaching and Learning Mathematics for Secondary and Middle School (3)
Students develop mathematics teaching skills, methods, and strategies including building study skills in mathematics. Students create daily lesson plans, unit plans, and year-long plans. Includes discussions and development of student assessment strategies. Participants experience simulated classroom teaching and are required to complete a minimum of 18 hours of school observation and participation. Not open to students who have earned credit for MA 4030. Springs.
Prerequisite(s): minimum grade of C in MA 4020 and Teacher Certification majors only.

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 4210 Topics in Mathematics Education (4)
Studies a topic, such as Number, Quantity and Algebra; Functions and Modeling; Geometry; or Data and Probability, usually with a focus on pedagogy at the middle or secondary level. The course is structured around activity-based cooperative learning with problem-solving and precise mathematical communication in the center of attention. Course is repeatable for credit, provided a different topic is studied. Springs.

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 Balzono-Weierstrass 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 4600 Internship in the Mathematical Sciences (1-6)
Student interns are sponsored by an organization whose activities require knowledge of mathematics (or mathematics education). Student interns should be placed in positions that require them to familiarize themselves with the uses made of mathematics by the organization. The mathematics that interns apply to the performance of their duties should be based on materials covered in the students' coursework, represent an extension of such material or require the students to learn new mathematics if necessary to their duties. The intern must arrange for a faculty sponsor. An Internship Review Committee, chaired by the faculty sponsor, with 2 additional members elected by departmental vote, shall, with the students' input: review the details of the prospective internship and decide on its feasibility, decide the number of credits to be awarded and prescribe an appropriate form and forum for a final report of internship activities. All arrangements must be approved by the Department Chair. Graded Pass/No Pass.
Prerequisite(s): permission of the Department Chair.

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