

Mathematics

The mathematics major prepares students for careers, graduate study, and professional programs requiring solid mathematical, quantitative, or analytical skills.

There are several degree programs from which to choose:

- Bachelor of Arts in Mathematics,
- Bachelor of Science in Mathematics,
- Bachelor of Science in Applied Mathematics,
- Bachelor of Science in Mathematics with Teaching,
- Bachelor of Science in Mathematics and Technology with Teaching,
- Bachelor of Science in Mathematics and Computer Science with Teaching, and
- Joint programs with Computer and Information Science, Economics, and Physics.

The Bachelor of Arts in Mathematics provides a solid mathematical foundation and also allows for the most flexibility.

The Bachelor of Science in Mathematics provides an in-depth theoretical background focusing on the traditional core areas of mathematics. This program provides a foundation for graduate study or careers in fields using sophisticated quantitative and mathematical analysis. In particular, this program is suitable preparation for graduate study in mathematics.

The Bachelor of Science in Applied Mathematics focuses on mathematical and computational methods applicable in the sciences, engineering, and industry. In particular, this degree is suitable preparation for professions featuring sophisticated mathematical modeling and/or scientific computing. This degree is also suitable preparation for graduate study in applied mathematics or related disciplines.

The Bachelor of Science in Mathematics with Teaching programs are aimed at students interested in teaching mathematics, possibly combined with technology or computer science, at the high school level. These programs combine a solid mathematical foundation with the pedagogical training necessary for success as a high school teacher. The programs also satisfy Pennsylvania's teacher certification requirements.

Accelerated +1 bachelor's and master's programs are also available.

Students should consult with an advisor to design a program best fitted to their interests and goals.

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Programs

- Applied Mathematics, B.S. (<http://bulletin.temple.edu/undergraduate/science-technology/mathematics/applied-mathematics-bs>)
- Mathematical Economics, B.A. (<http://bulletin.temple.edu/undergraduate/science-technology/mathematics/mathematical-economics-ba>)
- Mathematics & Computer Science, B.S. (<http://bulletin.temple.edu/undergraduate/science-technology/computer-information-science/mathematics-computer-science-bs/#math>)
- Mathematics & Computer Science with Teaching, B.S. (<http://bulletin.temple.edu/undergraduate/science-technology/tu-teach-programs/tu-teach-mathematics-computer-science-bs/#math>)
- Mathematics & Physics, B.S. (<http://bulletin.temple.edu/undergraduate/science-technology/physics/mathematics-physics-bs/#math>)
- Mathematics & Technology with Teaching, B.S. (<http://bulletin.temple.edu/undergraduate/science-technology/tu-teach-programs/tu-teach-mathematics-technology-bs/#math>)
- Mathematics with Teaching, B.S. (<http://bulletin.temple.edu/undergraduate/science-technology/tu-teach-programs/tu-teach-mathematics-bs/#math>)
- Mathematics, B.A. (<http://bulletin.temple.edu/undergraduate/science-technology/mathematics/ba-mathematics>)

- Mathematics, B.A./M.Ed. (<http://bulletin.temple.edu/undergraduate/science-technology/accelerated-programs/mathematics-ba-med/#math>)
- Mathematics, B.A./M.S. (<http://bulletin.temple.edu/undergraduate/science-technology/accelerated-programs/mathematics-ba-ms/#math>)
- Mathematics, B.S. (<http://bulletin.temple.edu/undergraduate/science-technology/mathematics/mathematics-bs>)
- Mathematics, B.S./M.Ed. (<http://bulletin.temple.edu/undergraduate/science-technology/accelerated-programs/mathematics-bs-med/#math>)
- Mathematics, B.S./M.S. (<http://bulletin.temple.edu/undergraduate/science-technology/accelerated-programs/mathematics-bs-ms/#math>)
- Mathematics, Minor (<http://bulletin.temple.edu/undergraduate/science-technology/mathematics/mathematics-minor>)

Courses

MATH 0701. Elementary Algebra. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course covers a basic treatment of algebraic expressions, linear equations and inequalities, polynomial operations, factoring, systems of linear equations, radical and rational expressions, quadratic equations, and various application problems. NOTE: This course does not count towards the number of credits required for graduation in the College of Science and Technology.

Repeatability: This course may not be repeated for additional credits.

MATH 0702. Intermediate Algebra. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I, and Summer II.

This course is designed as an intermediate algebra course that bridges the topics covered in Math 0701 and Math 1021. This course covers the real number system, basic properties of real numbers, operations with fractional expressions, simplifying complex fractions, powers and roots, operations with radicals, graphing linear equations and inequalities, and factoring of polynomials.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 1021| Required Courses:1|Minimum Grade of C-|May not be taken concurrently

OR MC2 Y|May not be taken concurrently

OR MC3 Y|May not be taken concurrently

OR MC4 Y|May not be taken concurrently

OR MC5 Y|May not be taken concurrently

OR MC6 Y|May not be taken concurrently

OR STAT 1001|Minimum Grade of C-|May be taken concurrently

OR STT2 Y|May not be taken concurrently

OR STAT 1102|Minimum Grade of C-|May be taken concurrently

OR STAT 1902|Minimum Grade of C-|May be taken concurrently

OR MC2A Y|May not be taken concurrently

OR MC3A Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently.

MATH 0823. Math for a Digital World. 4 Credit Hours.

This course is not offered every year.

How can I tell if an e-mail message is really from my bank? If I do online banking, can other people see the information? Does playing the lottery make sense? Does it make sense to draw for an inside straight? How can polling results differ so much from the election --- or do they? Sometimes the winner of an election in the U.S. gets much less than 50% of the vote. Would it make sense to have a run-off in such cases? How long will the world's oil last, assuming that we use more each year? How long will a million dollars last you, assuming it earns interest until you spend it? If you bought your text online, could someone tap into the Internet and get your credit card number when it's transmitted? Why does the VIN on your car have so many digits?

NOTE: This course fulfills the Quantitative Literacy (GQ) requirement for students under GenEd and a Quantitative Reasoning (QA or QB) requirement for students under Core. Students cannot receive credit for MATH 0823/0923 if they have successfully completed CIS 0823/0923.

Course Attributes: GQ

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C-|May not be taken concurrently

OR MATH 0800 to 0822| Required Courses:1|Minimum Grade of C-|May be taken concurrently

OR MATH 0824 to 1041| Required Courses:1|Minimum Grade of C-|May be taken concurrently

OR MC3 Y|May not be taken concurrently

OR MC4 Y|May not be taken concurrently

OR MC5 Y|May not be taken concurrently

OR MC6 Y|May not be taken concurrently

OR STAT 1001|Minimum Grade of C-|May be taken concurrently

OR STT2 Y|May not be taken concurrently

OR STAT 1102|Minimum Grade of C-|May be taken concurrently

OR STAT 1902|Minimum Grade of C-|May be taken concurrently

OR MC3A Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently.

MATH 0824. Mathematical Patterns. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course will convey the essence of mathematics and its current breadth. It sets out to describe mathematics as a rich and living part of human culture, and is intended for the general student with minimal mathematical knowledge. Exposure to this subject matter will contribute to students' educational breadth and intellectual development by sharpening their problem-solving skills, enhancing their understanding of logical reasoning and analysis, and strengthening their ability to use language and symbolic expression in a disciplined manner. The course will consist of a series of vignettes. Topics may include problem solving, voting theory, graph theory, finance, mathematical models, cryptography, statistics and probability.

NOTE: This course fulfills the Quantitative Literacy (GQ) requirement for students under GenEd and a Quantitative Reasoning (QA or QB) requirement for students under Core. Students cannot receive credit for MATH 0824 if they have successfully completed MATH 0924.

Course Attributes: GQ

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C-|May not be taken concurrently

OR MATH 0800 to 0823| Required Courses:1|Minimum Grade of C-|May be taken concurrently

OR MATH 0825 to 1041| Required Courses:1|Minimum Grade of C-|May be taken concurrently

OR MC3 Y|May not be taken concurrently

OR MC4 Y|May not be taken concurrently

OR MC5 Y|May not be taken concurrently

OR MC6 Y|May not be taken concurrently

OR STAT 1001|Minimum Grade of C-|May be taken concurrently

OR STT2 Y|May not be taken concurrently

OR STAT 1102|Minimum Grade of C-|May be taken concurrently

OR STAT 1902|Minimum Grade of C-|May be taken concurrently

OR MC3A Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently.

MATH 0828. Critical Reasoning and Problem Solving. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I, and Summer II.

The course teaches students how to deal with and solve complex problems by confronting them with critical analysis. We look at these problems both from an historical perspective and the practical view of how and when these types of problems affect the students' everyday lives. The course takes students through several key mathematical disciplines, including probability and statistics, including the hallmark of probability - reasoning under uncertainty - as well as set theory and counting techniques and graphing, especially with Venn diagrams, a skill they will find beneficial as the world turns to technology and graphics. For example, when we introduce probability, we cover the first dramatic application of the discipline, Mendel's discovery of the centuries-old problem of explaining the scientific laws of heredity as he gives birth to genetics. We also cover Mendel's use of statistics. This leads us to study modern uses of the same concepts in areas such as medicine - how to evaluate statistical studies and how to analyze topics such as false positives - as well as the application of DNA in areas such as how it has significantly changed our justice system.

Course Attributes: GQ

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C-|May not be taken concurrently
 OR MATH 0800 to 0827| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MATH 0829 to 1041| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MC3 Y|May not be taken concurrently
 OR MC4 Y|May not be taken concurrently
 OR MC5 Y|May not be taken concurrently
 OR MC6 Y|May not be taken concurrently
 OR STAT 1001|Minimum Grade of C-|May be taken concurrently
 OR STT2 Y|May not be taken concurrently
 OR STAT 1102|Minimum Grade of C-|May be taken concurrently
 OR STAT 1902|Minimum Grade of C-|May be taken concurrently
 OR MC3A Y|May not be taken concurrently
 OR MC6A Y|May not be taken concurrently.

MATH 0923. Honors Math for a Digital World. 4 Credit Hours.

This course is not offered every year.

How can I tell if an e-mail message is really from my bank? If I do online banking, can other people see the information? Does playing the lottery make sense? Does it make sense to draw for an inside straight? How can polling results differ so much from the election --- or do they? Sometimes the winner of an election in the U.S. gets much less than 50% of the vote. Would it make sense to have a run-off in such cases? How long will the world's oil last, assuming that we use more each year? How long will a million dollars last you, assuming it earns interest until you spend it? If you bought your text online, could someone tap into the Internet and get your credit card number when it's transmitted? Why does the VIN on your car have so many digits? (This is an Honors course.) NOTE: This course fulfills the Quantitative Literacy (GQ) requirement for students under GenEd and a Quantitative Reasoning (QA or QB) requirement for students under Core. Students cannot receive credit for this course if they have successfully completed MATH 0823 or CIS 0823/0923.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: GQ, HO

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C-|May not be taken concurrently
 OR MATH 0800 to 0922| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MATH 0924 to 1041| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MC3 Y|May not be taken concurrently
 OR MC4 Y|May not be taken concurrently
 OR MC5 Y|May not be taken concurrently
 OR MC6 Y|May not be taken concurrently
 OR MC3A Y|May not be taken concurrently
 OR MC6A Y|May not be taken concurrently
 OR STAT 1001|Minimum Grade of C-|May be taken concurrently
 OR STT2 Y|May not be taken concurrently
 OR STAT 1102|Minimum Grade of C-|May be taken concurrently
 OR STAT 1902|Minimum Grade of C-|May be taken concurrently.

MATH 0924. Honors Mathematical Patterns. 4 Credit Hours.

This course is typically offered in Fall and Spring.

This course will convey the essence of mathematics and its current breadth. It sets out to describe mathematics as a rich and living part of human culture, and is intended for the general student with minimal mathematical knowledge. Exposure to this subject matter will contribute to students' educational breadth and intellectual development by sharpening their problem-solving skills, enhancing their understanding of logical reasoning and analysis, and strengthening their ability to use language and symbolic expression in a disciplined manner. The course will consist of a series of vignettes. Topics may include problem solving, voting theory, graph theory, finance, mathematical models, cryptography, statistics and probability. (This is an Honors course.) NOTE: This course fulfills the Quantitative Literacy (GQ) requirement for students under GenEd and a Quantitative Reasoning (QA or QB) requirement for students under Core. Students cannot receive credit for MATH 0924 if they have successfully completed MATH 0824.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: GQ, HO

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C-|May not be taken concurrently
 OR MATH 0800 to 0923| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MATH 0925 to 1041| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MC3 Y|May not be taken concurrently
 OR MC4 Y|May not be taken concurrently
 OR MC5 Y|May not be taken concurrently
 OR MC6 Y|May not be taken concurrently
 OR MC3A Y|May not be taken concurrently
 OR MC6A Y|May not be taken concurrently
 OR STAT 1001|Minimum Grade of C-|May be taken concurrently
 OR STT2 Y|May not be taken concurrently
 OR STAT 1102|Minimum Grade of C-|May be taken concurrently
 OR STAT 1902|Minimum Grade of C-|May be taken concurrently.

MATH 1013. Elements of Statistics. 3 Credit Hours.

This course is typically offered in Fall, Spring, and Summer II.

This course provides a firm foundation for the study of statistics in other fields. Although no one field is emphasized to the exclusion of others, applications are drawn from psychology, political science, exercise science, and other areas. NOTE: This course can be used to satisfy the university Core Quantitative Reasoning B (QB) requirement. Although it may be usable towards graduation as a major requirement or university elective, it cannot be used to satisfy any of the university GenEd requirements. See your advisor for further information.

Course Attributes: QB

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C|May not be taken concurrently
 OR MATH 0800 to 1012| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MATH 1014 to 1021| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MC3 Y|May not be taken concurrently
 OR MC4 Y|May not be taken concurrently
 OR MC5 Y|May not be taken concurrently
 OR MC6 Y|May not be taken concurrently
 OR MC3A Y|May not be taken concurrently
 OR MC6A Y|May not be taken concurrently
 OR MA01 Y|May not be taken concurrently
 OR STAT 1001|Minimum Grade of C-|May be taken concurrently
 OR STT2 Y|May not be taken concurrently
 OR STAT 1102|Minimum Grade of C-|May be taken concurrently
 OR STAT 1902|Minimum Grade of C-|May be taken concurrently.

MATH 1015. Introduction to Numbers & Figures. 4 Credit Hours.

This course is typically offered in Fall, Spring, and Summer I.

This is a course intended for students wishing to familiarize themselves with basic arithmetic and geometric concepts. Subjects include the real numbers, the decimal system, and fractions, elementary number theory (primes, gcd, lcm, rational and irrational numbers), and geometry (angles, triangles, polygons, polyhedra, circles, spheres, symmetry, congruence, and similarity).

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C-|May not be taken concurrently

OR MATH 1021|Minimum Grade of C-|May be taken concurrently

OR MC3 Y|May not be taken concurrently

OR MC4 Y|May not be taken concurrently

OR MC5 Y|May not be taken concurrently

OR MC6 Y|May not be taken concurrently

OR MC3A Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently

OR STAT 1001|Minimum Grade of C-|May be taken concurrently

OR STT2 Y|May not be taken concurrently

OR STAT 1102|Minimum Grade of C-|May be taken concurrently

OR STAT 1902|Minimum Grade of C-|May be taken concurrently.

MATH 1018. Mathematics for Business. 3 Credit Hours.

This course is not offered every year.

Fundamentals of finite mathematics necessary for a business student to pursue statistics and other quantitatively oriented business courses. Topics and illustrations are specifically directed to applications in business and economics. Topics include algebraic concepts; linear, quadratic, polynomial and rational functions; logarithm and exponential functions; elementary matrix manipulations. Fitting of curves, interest rate calculations, present and future values of annuities are some of the specific applications. Use of a graphing calculator. NOTE: (1) Duplicate Course: Students cannot receive credit for Math 1018 if they have successfully completed Statistics 1001. (2) This course can be used to satisfy the university Core Quantitative Reasoning A (QA) requirement. Although it may be usable towards graduation as a major requirement or university elective, it cannot be used to satisfy any of the university GenEd requirements. See your advisor for further information.

Course Attributes: QA

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0701 to 0702| Required Courses:1|Minimum Grade of C|May not be taken concurrently

OR MATH 1021 to 1022| Required Courses:1|Minimum Grade of D|May be taken concurrently

OR MC3 Y|May not be taken concurrently

OR MC4 Y|May not be taken concurrently

OR MC5 Y|May not be taken concurrently

OR MC6 Y|May not be taken concurrently

OR MC3A Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently

OR MA01 Y|May not be taken concurrently

OR STAT 1001|Minimum Grade of C-|May be taken concurrently

OR STT2 Y|May not be taken concurrently

OR STAT 1102|Minimum Grade of C-|May be taken concurrently

OR STAT 1902|Minimum Grade of C-|May be taken concurrently.

MATH 1021. College Algebra. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course covers polynomial, rational and algebraic expressions, equations and inequalities. It also includes some topics in graphing, an introduction to the concept of a function, and a brief introduction to the exponential and logarithmic functions. NOTE: This course can be used to satisfy the university Core Quantitative Reasoning A (QA) requirement. Although it may be usable towards graduation as a major requirement or university elective, it cannot be used to satisfy any of the university GenEd requirements. See your advisor for further information.

Course Attributes: QA

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 0702|Minimum Grade of C|May not be taken concurrently
 OR MATH 1015|Minimum Grade of C|May not be taken concurrently
 OR MATH 1022|Minimum Grade of D|May not be taken concurrently
 OR MC4 Y|May not be taken concurrently
 OR MC5 Y|May not be taken concurrently
 OR MC6 Y|May not be taken concurrently
 OR MC6A Y|May not be taken concurrently
 OR MA01 Y|May not be taken concurrently
 OR MA02 Y|May not be taken concurrently
 OR STAT 1001|Minimum Grade of C-|May be taken concurrently
 OR STT2 Y|May not be taken concurrently
 OR STAT 1102|Minimum Grade of C-|May be taken concurrently
 OR STAT 1902|Minimum Grade of C-|May be taken concurrently.

MATH 1022. Precalculus. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course is designed to prepare students for the calculus courses. Topics include functions and function operations, one-to-one and inverse functions, exponential and logarithmic functions, trigonometric functions, inverse trigonometric functions, basic trigonometric identities, polar coordinates, and an introduction to vectors. The course also contains a brief review of basic algebra. NOTE: This course can be used to satisfy the university Core Quantitative Reasoning A (QA) requirement. Although it may be usable towards graduation as a major requirement or university elective, it cannot be used to satisfy any of the university GenEd requirements. See your advisor for further information.

Course Attributes: QA

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1021|Minimum Grade of C|May not be taken concurrently
 OR MATH 1041|Minimum Grade of D|May not be taken concurrently
 OR MATH 1038|Minimum Grade of D|May not be taken concurrently
 OR MC5 Y|May not be taken concurrently
 OR MC6 Y|May not be taken concurrently
 OR MA03 Y|May not be taken concurrently
 OR MC6A Y|May not be taken concurrently.

MATH 1031. Differential and Integral Calculus. 4 Credit Hours.

This course is typically offered in Fall and Spring.

This is a calculus course in the reform style that will introduce students to the basic concepts of differential and integral calculus. The emphasis of the course will be on understanding the concepts (intuitively rather than rigorously). However, the course will also cover the basic techniques of differentiation and some techniques of integration. NOTE: (1) This is the course appropriate for those students who are taking calculus in order to fulfill the quantitative core requirements. (2) This course can be used to satisfy the university Core Quantitative Reasoning B (QB) requirement or the GenEd Quantitative Literacy (GQ) requirement.

Course Attributes: QB

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1021|Minimum Grade of C|May not be taken concurrently

OR MC5 Y|May not be taken concurrently

OR MC6 Y|May not be taken concurrently

OR MA03 Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently.

MATH 1033. Computing in MATLAB. 1.5 Credit Hour.

This course is designed as an introduction to MATLAB and as preparation for computing in undergraduate applied mathematics courses. Topics include computer arithmetic, vectors and matrices, graphics, loops, functions, and conditional operators. No prior programming or MATLAB skills are required.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1022|Minimum Grade of C|May not be taken concurrently

OR MATH 1039|Minimum Grade of C|May be taken concurrently

OR MC6 Y|May not be taken concurrently

OR MA04 Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently.

MATH 1039. Lab for Calculus I. 1 Credit Hour.

This course is typically offered in Fall and Spring.

This is the lab component of MATH 1041, a first semester calculus course that involves both theory and applications. MATH 1039 is required for students who earned a grade of C- in MATH 1022 Precalculus. Students with no previous calculus experience or those needing extra review of algebra and precalculus topics are strongly encouraged to register for MATH 1039. Topics include algebra and precalculus in the context of the topics covered in MATH 1041.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1022|Minimum Grade of C-|May not be taken concurrently

OR MATH 1041|Minimum Grade of D|May not be taken concurrently

OR MATH 1042|Minimum Grade of D|May not be taken concurrently

OR MATH 1044|Minimum Grade of D|May not be taken concurrently

OR MATH 1941|Minimum Grade of D|May not be taken concurrently

OR MATH 1942|Minimum Grade of D|May not be taken concurrently

OR MATH 1951|Minimum Grade of D|May not be taken concurrently

OR MC6 Y|May not be taken concurrently

OR MA04 Y|May not be taken concurrently

OR MC6A Y|May not be taken concurrently.

MATH 1041. Calculus I. 4 Credit Hours.

This course is typically offered in Fall.

This is a first semester calculus course primarily for students with some calculus background or strong precalculus skills. It involves both theory and applications. Students who earned a grade of C- in MATH 1022 must register for MATH 1039 simultaneously with MATH 1041. Students with no previous calculus experience or those needing extra review of precalculus topics are strongly encouraged to register for MATH 1039. Topics include functions, limits and continuity, differentiation of algebraic, trigonometric, exponential and logarithmic functions, curve sketching, optimization and L'Hospital's rule. NOTE: (1) Students may not get credit for more than one of MATH 1041 and MATH 1941. (2) This course can be used to satisfy the university Core Quantitative Reasoning B (QB) requirement or the GenEd Quantitative Literacy (GQ) requirement. However, this course is not appropriate for students whose sole purpose is to fulfill the quantitative core requirements. They should take MATH 1031 instead.

Course Attributes: QB

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1022|Minimum Grade of C|May not be taken concurrently
OR (MATH 1022|Minimum Grade of C-|May not be taken concurrently
AND MATH 1039|Minimum Grade of C|May be taken concurrently)
OR MATH 1042|Minimum Grade of D|May not be taken concurrently
OR MATH 1044|Minimum Grade of D|May not be taken concurrently
OR MATH 1942|Minimum Grade of D|May not be taken concurrently
OR MATH 1951|Minimum Grade of D|May not be taken concurrently
OR MC6 Y|May not be taken concurrently
OR MA04 Y|May not be taken concurrently
OR MC6A Y|May not be taken concurrently.

MATH 1042. Calculus II. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This is a second semester calculus course that involves both theory and applications. Topics include the definite integral and the Fundamental Theorem of Calculus, applications of the definite integral, techniques of integration, improper integrals and sequences and series, including power and Taylor series.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1041|Minimum Grade of C|May not be taken concurrently
OR MATH 1941|Minimum Grade of C|May not be taken concurrently
OR MATH 1038|Minimum Grade of C|May not be taken concurrently
OR MATH 2043|Minimum Grade of D|May not be taken concurrently
OR MA06 Y|May not be taken concurrently.

MATH 1044. Introduction to Probability and Statistics for the Life Sciences. 4 Credit Hours.

This course is typically offered in Fall and Spring.

A one-semester course at the freshman level to follow Calculus I for majors in Biology and Earth and Environmental Sciences (EES). Probabilistic and statistical methods needed for empirical modeling and associated data analysis, with examples primarily taken from the life sciences. This course does not serve as a prerequisite to Calculus III. Primarily for majors in Biology and EES.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1041|Minimum Grade of C|May not be taken concurrently
OR MATH 1038|Minimum Grade of C|May not be taken concurrently
OR MATH 1941|Minimum Grade of C|May not be taken concurrently
OR MATH 1951|Minimum Grade of C|May not be taken concurrently
OR MATH 2043 to 3080| Required Courses:1|Minimum Grade of C-|May be taken concurrently
OR MA06 Y|May not be taken concurrently.

MATH 1941. Honors Calculus I. 4 Credit Hours.

This course is typically offered in Fall and Spring.

This is a first semester calculus course that involves both theory and applications. Topics include functions, limits and continuity, differentiation of algebraic, trigonometric, exponential and logarithmic functions, curve sketching, optimization and L'Hospital's Rule. NOTE: This course can be used to satisfy the university Core Quantitative Reasoning B (QB) requirement or the GenEd Quantitative Literacy (GQ) requirement. However, this course is not appropriate for students whose sole purpose is to fulfill the quantitative core requirements. They should take Math 1031 instead.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: HO, QB

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1022|Minimum Grade of C|May not be taken concurrently
 OR MATH 1042|Minimum Grade of D|May not be taken concurrently
 OR MATH 1044|Minimum Grade of D|May not be taken concurrently
 OR MATH 1942|Minimum Grade of D|May not be taken concurrently
 OR MATH 1951|Minimum Grade of D|May not be taken concurrently
 OR MC6 Y|May not be taken concurrently
 OR MA04 Y|May not be taken concurrently
 OR MC6A Y|May not be taken concurrently.

MATH 1942. Honors Calculus II. 4 Credit Hours.

This course is typically offered in Fall and Spring.

This is a second semester calculus course that involves both theory and applications. Topics include the definite integral and the Fundamental Theorem of Calculus, applications of the definite integral, techniques of integration, improper integrals and sequences and series, including power and Taylor series.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: HO

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1041|Minimum Grade of C|May not be taken concurrently
 OR MATH 1941|Minimum Grade of C|May not be taken concurrently
 OR MATH 1038|Minimum Grade of C|May not be taken concurrently
 OR MATH 2043|Minimum Grade of D|May not be taken concurrently
 OR MA06 Y|May not be taken concurrently.

MATH 1951. Honors Accelerated Calculus I & II. 4 Credit Hours.

This course is typically offered in Fall.

This is a course for students who have had a year of calculus in high school. Its purpose is two-fold: to present a more theoretical treatment of calculus than is usually seen in an American high school and to prepare students for Math 2043, Calculus III. Topics covered will include some or all of the following: limits and continuity, derivatives and rules of differentiation, the Mean Value Theorem, L'Hospital's rule, optimization, graphing, the definite integral and the Fundamental Theorem of Calculus, u-substitution and integration by parts, limits of sequences, infinite series, convergence tests, power series, and Taylor series. NOTE: Prior to summer 2010, the course title was "Honors Differential & Integral Calculus."

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: HO

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 1041|Minimum Grade of C|May not be taken concurrently
 OR MATH 1941|Minimum Grade of C|May not be taken concurrently
 OR MATH 1038|Minimum Grade of C|May not be taken concurrently
 OR MA06 Y|May not be taken concurrently)
 AND (MATH 1042|Minimum Grade of C|May not be taken concurrently
 OR MATH 1942|Minimum Grade of C|May not be taken concurrently
 OR MA07 Y|May not be taken concurrently)

MATH 2021. Functions and Modeling. 3 Credit Hours.

This course is typically offered in Spring.

In this course, required for TTeach Mathematics with Teaching majors, students will give presentations and work in small groups to engage in explorations and lab activities designed to strengthen and expand their knowledge of the topics found in secondary mathematics; illuminate the connections between secondary and college mathematics and between various areas of mathematics; and illustrate productive uses of technology in teaching. Students will engage in non-routine problem solving, problem-based learning, and applications of mathematics. The course consists of four units: 1) Functions, 2) Modeling, 3) Overlooked Topics and Explorations, and 4) Geometry of Complex Numbers. Specific topics of investigation include function properties and patterns, complex numbers, parametric equations, polar equations, vectors, and exponential growth and decay. Explorations involve the use of multiple representations, transformations, data analysis techniques (such as curve fitting) and interconnections among topics in algebra, analytic geometry, statistics, trigonometry, and calculus. The lab investigations include use of various technologies including computers, calculators, and computer graphing software.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 1042|Minimum Grade of C-|May not be taken concurrently
OR MATH 1951|Minimum Grade of C-|May not be taken concurrently)
AND (SCTC 1189|Minimum Grade of C-|May not be taken concurrently
OR SCTC 1289|Minimum Grade of C-|May not be taken concurrently
OR SCTC 1389|Minimum Grade of C-|May not be taken concurrently
OR MGRE 3111|Minimum Grade of C-|May not be taken concurrently)

MATH 2031. Probability and Statistics. 3 Credit Hours.

This course is typically offered in Fall and Spring.

This course presents basic principles of statistical reasoning and the concepts from probability theory that give the student an understanding of the logic behind statistical techniques. Topics covered include rules of probability, discrete probability distributions, normal distribution, sampling distributions, the central limit theorem, point estimation, interval estimation, tests concerning means, tests based on count data, correlation and regression, and nonparametric statistics. NOTE: This course cannot be credited towards graduation if taken after Math 3031.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1031|Minimum Grade of C-|May not be taken concurrently
OR MATH 1041|Minimum Grade of C-|May not be taken concurrently
OR MATH 1042|Minimum Grade of C-|May not be taken concurrently
OR MATH 1044|Minimum Grade of C-|May not be taken concurrently
OR MATH 1942|Minimum Grade of C-|May not be taken concurrently
OR MATH 2043 to 3080| Required Courses:1|Minimum Grade of C-|May be taken concurrently
OR STAT 1102|Minimum Grade of C-|May not be taken concurrently
OR STAT 1902|Minimum Grade of C-|May not be taken concurrently.

MATH 2043. Calculus III. 4 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This is a third semester calculus course that involves both theory and applications. Topics include vectors in two or three dimensions, lines and planes in space, parametric equations, vector functions and their derivatives, functions of several variables, partial derivatives, multiple integrals, line integrals, and Green's, Divergence and Stokes' theorems.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently
OR MATH 1942|Minimum Grade of C|May not be taken concurrently
OR MATH 1951|Minimum Grade of C|May not be taken concurrently
OR MA07 Y|May not be taken concurrently.

MATH 2061. Euclidean Geometry. 3 Credit Hours.

This course is typically offered in Spring.

Students will be introduced to mathematical proofs and reasoning in the context of Euclidean geometry. The course will provide a foundation for more advanced courses in geometry and other proof-based mathematics courses.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently
 OR MATH 1942|Minimum Grade of C|May not be taken concurrently
 OR MATH 1951|Minimum Grade of C|May not be taken concurrently
 OR MATH 2043|Minimum Grade of C|May be taken concurrently
 OR MATH 2100 to 3080| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MA07 Y|May not be taken concurrently.

MATH 2082. Sophomore Directed Study. 1 to 4 Credit Hour.

This course is typically offered in Fall, Spring, Summer I, and Summer II.

Intensive study in a specific area. This course does not count for a mathematics related major elective credit. Prerequisites are MATH 1042 and a GPA of 3.5 or higher.

Repeatability: This course may not be repeated for additional credits.

MATH 2101. Linear Algebra. 3 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This course covers vectors and vector spaces, matrices, determinants, systems of linear equations, linear transformations, inner products and orthogonality, and eigenvectors and eigenvalues. NOTE: Only one course, Math 2101 or Math 2103, can be credited towards graduation.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently
 OR MATH 1942|Minimum Grade of C|May not be taken concurrently
 OR MATH 1951|Minimum Grade of C|May not be taken concurrently
 OR MA07 Y|May not be taken concurrently.

MATH 2103. Linear Algebra with Computer Lab. 4 Credit Hours.

This course is typically offered in Fall.

Topics in this course include: systems of linear equations; matrix algebra; determinants; fundamental subspaces; linear transformations; eigenvalues and eigenvectors; inner products; orthogonality; and spectral theory. Included is a computational lab component that uses activities and applications designed to promote understanding of the basic concepts from algebraic, symbolic, and geometric viewpoints. NOTE: Only one course, Math 2101 or Math 2103, can be credited towards graduation.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently
 OR MATH 1942|Minimum Grade of C|May not be taken concurrently
 OR MATH 1951|Minimum Grade of C|May not be taken concurrently
 OR MA07 Y|May not be taken concurrently.

MATH 2111. Basic Concepts of Math. 3 Credit Hours.

This course is typically offered in Fall, Spring, and Summer I.

This is a course designed to introduce students to mathematical abstraction and the language of mathematical proof. Topics include logic, sets, relations, integers, induction and modular arithmetic, functions, and cardinality. This course is highly recommended for students who have not been exposed to mathematical proof and intend to take advanced math courses.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently
 OR MATH 1942|Minimum Grade of C|May not be taken concurrently
 OR MATH 1951|Minimum Grade of C|May not be taken concurrently
 OR MATH 2043 to 2110| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MATH 2112 to 3080| Required Courses:1|Minimum Grade of C-|May be taken concurrently
 OR MA07 Y|May not be taken concurrently.

MATH 2943. Honors Calculus III. 4 Credit Hours.

This course is typically offered in Fall and Spring.

This is a third semester calculus course that involves both theory and applications. Topics include vectors in two or three dimensions, lines and planes in space, parametric equations, vector functions and their derivatives, functions of several variables, partial derivatives, multiple integrals, line integrals, and Green's, Divergence and Stokes' theorems.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: HO

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently
OR MATH 1942|Minimum Grade of C|May not be taken concurrently
OR MATH 1951|Minimum Grade of C|May not be taken concurrently
OR MA07 Y|May not be taken concurrently.

MATH 3003. Theory of Numbers. 3 Credit Hours.

This course is typically offered in Fall and Spring.

Divisibility properties of integers, prime factorization, distribution of primes, linear and quadratic congruences, primitive roots, quadratic residues, quadratic reciprocity, simple Diophantine equations, cryptography.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 2111|Minimum Grade of C-|May not be taken concurrently.

MATH 3031. Probability Theory I. 3 Credit Hours.

This course is typically offered in Fall and Spring.

Counting techniques, axiomatic definition of probability, conditional probability, independence of events, Bayes Theorem, random variables, discrete and continuous probability distributions, expected values, moments and moment generating functions, joint probability distributions, functions of random variables, covariance and correlation. NOTE: Prior to summer 2010, the course title was "Introduction to Probability Theory."

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently
OR MATH 1942|Minimum Grade of C|May not be taken concurrently
OR MATH 1951|Minimum Grade of C|May not be taken concurrently
OR MATH 2043|Minimum Grade of C-|May be taken concurrently
OR MA07 Y|May not be taken concurrently.

MATH 3032. Mathematical Statistics. 3 Credit Hours.

This course is typically offered in Spring.

Random sampling, sampling distributions, Student's t, chi-squared and F distributions, unbiasedness, minimum variance unbiased estimators, confidence intervals, tests of hypothesis, Neyman-Pearson Lemma, and uniformly most powerful tests. NOTE: Prior to summer 2010, the course title was "Introduction to Mathematical Statistics."

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3031|Minimum Grade of C-|May not be taken concurrently
OR AS 2101|Minimum Grade of C-|May not be taken concurrently.

MATH 3041. Differential Equations I. 3 Credit Hours.

This course is typically offered in Fall, Spring, Summer I and Summer II.

This is a course in ordinary differential equations. Topics include first order ordinary differential equations, linear second order ordinary differential equations, systems of differential equations, numerical methods and the Laplace transform.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 2043|Minimum Grade of C-|May be taken concurrently.

MATH 3042. Differential Equations II. 4 Credit Hours.

This course is not offered every year.

This is a second course in differential equations. Topics include orthogonal polynomials, including Legendre and Chebyshev polynomials, Fourier series, partial differential equations, the boundary value problems and other topics of the instructor's choice. NOTE: This course is offered only in odd-numbered years.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3041|Minimum Grade of C-|May not be taken concurrently
OR MATH 3045|Minimum Grade of C-|May not be taken concurrently.

MATH 3043. Numerical Analysis I. 3 to 4 Credit Hours.

This course is typically offered in Fall.

Computer arithmetic, pitfalls of computation, iterative methods for the solution of a single nonlinear equation, interpolation, least squares, numerical differentiation, numerical integration, and solutions of linear systems by direct and iterative methods.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2043|Minimum Grade of C-|May not be taken concurrently)
AND (MATH 2101|Minimum Grade of C-|May not be taken concurrently)
OR MATH 2103|Minimum Grade of C-|May not be taken concurrently)
AND (CIS 1053|Minimum Grade of C-|May not be taken concurrently)
OR CIS 1057|Minimum Grade of C-|May not be taken concurrently
OR CIS 1068|Minimum Grade of C-|May not be taken concurrently
OR PHYS 2501|Minimum Grade of C-|May not be taken concurrently)

MATH 3044. Numerical Analysis II. 3 Credit Hours.

This course is typically offered in Spring.

Solution of systems of nonlinear equations, solution of initial value problems, matrix norms and the analysis of iterative solutions, numerical solution of boundary value problems and partial differential equations, and introduction to the finite element method. NOTE: Offered in even-numbered years only.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3043|Minimum Grade of C-|May not be taken concurrently.

MATH 3045. Differential Equations with Linear Algebra. 4 Credit Hours.

This course is typically offered in Fall.

This is a course in ordinary differential equations that emphasizes the use of linear algebra. It has two objectives: 1) to teach students how to solve linear differential equations and systems of linear differential equations, and 2) to introduce students to the linear algebra concepts such as vector spaces, dimension, basis, matrices, eigenvalues and eigenvectors, that play a key role in the theory of linear differential equations.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 2043|Minimum Grade of C|May be taken concurrently
OR MA08 Y|May not be taken concurrently.

MATH 3046. Differential Equations with Computer Lab. 4 Credit Hours.

This course is typically offered in Spring.

This course combines traditional material with a modern systems approach. It presents a thorough introduction to differential equations, tempering a classic "pure math" approach with more practical applied aspects. The course covers key topics such as first order equations, matrix algebra, systems, and phase plane portraits. The focus is on interpreting and solving problems through the use of software support and technology projects. Using software tools graphics will be used to display the ideas in ODEs; modeling and applications; and projects. An objective is to provide students with the opportunity to bring together much of what they have learned, including analytical, computational, and interpretative skills.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 2043|Minimum Grade of C|May be taken concurrently
OR MA08 Y|May not be taken concurrently.

MATH 3051. Theoretical Linear Algebra. 4 Credit Hours.

This course is typically offered in Spring.

This is a course in linear algebra with a higher degree of abstraction than a traditional undergraduate linear algebra course. Topics include vector spaces, linear transformations, determinants, eigenvalues and eigenvectors, canonical forms, inner product spaces, and bilinear forms.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2111|Minimum Grade of C|May not be taken concurrently)
AND (MATH 3045|Minimum Grade of C-|May not be taken concurrently)
OR MATH 2101|Minimum Grade of C-|May not be taken concurrently
OR MATH 2103|Minimum Grade of C-|May not be taken concurrently)

MATH 3061. Modern Geometry I. 3 Credit Hours.

This course is typically offered in Fall.

An introduction to Euclidean and Noneuclidean geometries with a particular emphasis on theory and proofs.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2061|Minimum Grade of C-|May not be taken concurrently)
OR MATH 2111|Minimum Grade of C-|May not be taken concurrently)
AND (MATH 2101|Minimum Grade of C-|May not be taken concurrently)
OR MATH 2103|Minimum Grade of C-|May not be taken concurrently)
OR MATH 3051|Minimum Grade of C-|May not be taken concurrently)

MATH 3082. Junior Individual Study. 1 to 4 Credit Hour.

This course is typically offered in Fall, Spring, Summer I and Summer II.

Intensive study in a specific area. NOTE: May be taken in either semester.

Repeatability: This course may be repeated for additional credit.

MATH 3083. Junior Directed Reading. 1 to 4 Credit Hour.

This course is typically offered in Fall, Spring, Summer I and Summer II.

Intensive study in a specific area. NOTE: May be taken in either semester.

Repeatability: This course may be repeated for additional credit.

MATH 3096. Introduction to Modern Algebra. 3 Credit Hours.

This course is typically offered in Fall and Spring.

This is a one-semester course in modern algebra that covers topics from group, ring, and field theory. Topics include groups and their basic properties, subgroups, normal subgroups and quotient groups, group homomorphisms, rings, rings of integers and polynomial rings, congruences in the rings of integers and polynomial rings, ideals and quotient rings, ring homomorphism, fields and field extensions, Galois theory.

Course Attributes: WI

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 2111|Minimum Grade of C-|May not be taken concurrently.

MATH 3098. Modern Algebra. 3 Credit Hours.

This course is typically offered in Fall.

This is the first semester in a year-long modern algebra sequence Math 3098 - Math 3101. It is a thorough introduction to the theory of groups and rings.

NOTE: Students who have had limited exposure to proofs should consider taking Math 2111 first.

Course Attributes: WI

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2111|Minimum Grade of C|May not be taken concurrently)

AND (MATH 2101|Minimum Grade of C|May not be taken concurrently)

OR MATH 2103|Minimum Grade of C|May not be taken concurrently

OR MATH 3045|Minimum Grade of C-|May not be taken concurrently

OR MA09 Y|May not be taken concurrently

OR MA10 Y|May not be taken concurrently)

MATH 3101. Topics in Modern Algebra. 3 Credit Hours.

This course is typically offered in Spring.

This is the second semester of a year-long modern algebra course. Topics come from theory of rings, fields and modules and from Galois theory.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3098|Minimum Grade of C-|May not be taken concurrently.

MATH 3137. Real & Complex Analysis I. 3 Credit Hours.

This course is typically offered in Fall.

Real and complex number systems, completeness. Sequences and series and their limits. Continuity of real and complex functions. Derivative. Analytic functions. Power series.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2043|Minimum Grade of C|May not be taken concurrently)

OR MA08 Y|May not be taken concurrently)

AND (MATH 2111|Minimum Grade of C-|May not be taken concurrently)

MATH 3138. Real & Complex Analysis II. 3 Credit Hours.

This course is typically offered in Spring.

The Riemann-Stieltjes integral. Cauchy integral theorem. Cauchy integral formula and its consequences. The calculus of residues.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3137|Minimum Grade of C-|May not be taken concurrently

OR MATH 3141|Minimum Grade of C-|May not be taken concurrently.

MATH 3141. Advanced Calculus I. 3 Credit Hours.

This course is typically offered in Fall.

This is a first semester course in real analysis. Topics include the real number system and the completeness property, sequences and their limits, limits of real-valued functions and continuity and point-set topology of Euclidean spaces. NOTE: Students who have had limited exposure to proofs should consider taking Math 2111 first.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2043|Minimum Grade of C|May not be taken concurrently

OR MA08 Y|May not be taken concurrently)

AND (MATH 2111|Minimum Grade of C|May not be taken concurrently

OR MA11 Y|May not be taken concurrently)

AND (MATH 2101|Minimum Grade of C|May not be taken concurrently

OR MATH 2103|Minimum Grade of C|May not be taken concurrently

OR MATH 3045|Minimum Grade of C|May not be taken concurrently

OR MA09 Y|May not be taken concurrently

OR MA10 Y|May not be taken concurrently)

MATH 3142. Advanced Calculus II. 3 Credit Hours.

This course is typically offered in Spring.

This is a second semester course in real analysis. Topics include the derivative and differentiable functions, the Riemann integral, infinite series and convergence tests, power and Taylor series and operations with them, and topics from calculus of several variables.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3141|Minimum Grade of C-|May not be taken concurrently.

MATH 3500. Topics in Contemporary Mathematics. 3 Credit Hours.

This course provides an in depth exposure to selected topics in advanced mathematics.

Repeatability: This course may be repeated for additional credit.

Pre-requisites:

MATH 1042|Minimum Grade of C|May not be taken concurrently

OR MATH 1942|Minimum Grade of C|May not be taken concurrently

OR MATH 2043|Minimum Grade of C-|May be taken concurrently

OR MATH 2943|Minimum Grade of C-|May be taken concurrently.

MATH 3941. Honors Differential Equations I. 3 Credit Hours.

This course is typically offered in Fall and Spring.

This is a course in ordinary differential equations. Topics include first order ordinary differential equations, linear second order ordinary differential equations, systems of differential equations, numerical methods and the Laplace transform. Additional topics may include series solutions to differential equations, the matrix exponential, and various applications.

Cohort Restrictions: Must be enrolled in one of the following Cohorts: SCHONORS, UHONORS, UHONORSTR.

Course Attributes: HO

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 2043|Minimum Grade of C-|May be taken concurrently

OR MATH 2943|Minimum Grade of C-|May be taken concurrently.

MATH 4001. History of Mathematics. 3 Credit Hours.

This course is not offered every year.

The development of the major mathematical concepts from ancient times to the present, emphasizing topics in the standard undergraduate curriculum. Special attention will be paid to the history of mathematics and mathematics education in the United States. NOTE: Offered in even-numbered years only.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3001 to 4999| Required Courses:1|Minimum Grade of C|May not be taken concurrently.

MATH 4003. Combinatorics. 3 Credit Hours.

This course is not offered every year.

Basic theorems and applications of combinatorial analysis, including generating functions, difference equations, Polya's theory of counting, graph theory, matching, and block diagrams. NOTE: Offered in odd-numbered years only.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 2111|Minimum Grade of C-|May not be taken concurrently
OR MATH 2196|Minimum Grade of C-|May not be taken concurrently
OR MATH 3003|Minimum Grade of C-|May not be taken concurrently.

MATH 4033. Probability Theory II. 3 Credit Hours.

This course is typically offered in Fall.

Markov chains, exponential distribution, Poisson process, continuous time Markov chains, Brownian motion, stationary processes. NOTE: Prior to summer 2010, the course title was "Introduction to Probability Theory."

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3031|Minimum Grade of C-|May not be taken concurrently
OR MATH 3033|Minimum Grade of C-|May not be taken concurrently
OR AS 2101|Minimum Grade of C-|May not be taken concurrently.

MATH 4041. Partial Differential Equations. 3 Credit Hours.

This course is typically offered in Spring.

The solution and properties of first and second order equations; heat and wave equation. Elliptic boundary value problems and Green's functions. Hyperbolic problems and the theory of characteristics. Finite difference methods. The equations of mathematical physics.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2101|Minimum Grade of C-|May not be taken concurrently
OR MATH 2103|Minimum Grade of C-|May not be taken concurrently
OR MATH 3051|Minimum Grade of C-|May not be taken concurrently)
AND (MATH 3041|Minimum Grade of C-|May not be taken concurrently
OR MATH 3045|Minimum Grade of C-|May not be taken concurrently)

MATH 4043. Applied Mathematics. 3 Credit Hours.

This course is typically offered in Fall.

The construction and study of mathematical models for physical, economic, and social processes. NOTE: Offered in odd-numbered years only.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2101|Minimum Grade of C-|May not be taken concurrently
OR MATH 2103|Minimum Grade of C-|May not be taken concurrently
OR MATH 3051|Minimum Grade of C-|May not be taken concurrently)
AND (MATH 3041|Minimum Grade of C-|May not be taken concurrently
OR MATH 3045|Minimum Grade of C-|May not be taken concurrently
OR MATH 3046|Minimum Grade of C-|May not be taken concurrently)

MATH 4051. Complex Analysis. 3 Credit Hours.

This course is typically offered in Fall.

Complex numbers, analytic functions, harmonic functions, power and Laurent series, Cauchy's theorem, calculus of residues, and conformal mappings.

NOTE: Prior to summer 2010, the course title was "Introduction to Functions of a Complex Variable."

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

MATH 3138|Minimum Grade of C|May not be taken concurrently

OR MATH 3142|Minimum Grade of C-|May not be taken concurrently

OR MA12 Y|May not be taken concurrently.

MATH 4061. Differential Geometry. 3 Credit Hours.

This course is typically offered in Spring of even years.

This course is an introduction to differential geometry starting with concepts learned in Calculus III. A particular emphasis will be placed on the study of curves and surfaces in 3-space and their generalizations. The course will revolve around Riemannian geometry, but, time permitting, it will also include a brief introduction to one or more of the following: symplectic geometry and its relation to classical mechanics, general connections and their relation with field theory and pseudoriemannian manifolds, and general relativity.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 2043|Minimum Grade of C|May not be taken concurrently

OR MA08 Y|May not be taken concurrently)

AND (MATH 2101|Minimum Grade of C-|May not be taken concurrently

OR MATH 2103|Minimum Grade of C-|May not be taken concurrently

OR MATH 3051|Minimum Grade of C-|May not be taken concurrently)

MATH 4063. Topology I. 3 Credit Hours.

This course is typically offered in Spring of odd years.

Topological and metric spaces. Continuity, compactness, connectedness, convergence. Introduction to algebraic and combinatorial topology.

Classification of compact surfaces, fundamental groups and covering spaces.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 3137|Minimum Grade of C-|May not be taken concurrently

OR MATH 3141|Minimum Grade of C-|May not be taken concurrently)

AND (MATH 3096|Minimum Grade of C-|May not be taken concurrently

OR MATH 3098|Minimum Grade of C-|May not be taken concurrently)

MATH 4082. Senior Individual Study. 1 to 4 Credit Hour.

This course is typically offered in Fall, Spring, Summer I and Summer II.

Intensive individual study at a senior or graduate level. Arranged each semester. Please consult with the instructor. NOTE: Can be taken in either semester.

Repeatability: This course may be repeated for additional credit.

MATH 4083. Senior Directed Reading. 1 to 4 Credit Hour.

This course is typically offered in Fall, Spring, Summer I and Summer II.

Intensive individual study at a senior or graduate level. Arranged each semester. Please consult with the instructor. NOTE: Can be taken in either semester.

Repeatability: This course may be repeated for additional credit.

MATH 4096. Senior Problem Solving. 3 Credit Hours.

This course is typically offered in Fall and Spring.

This is a course in mathematical discovery through problem solving. Students will be expected to develop two or three areas of mathematics by solving problems, assigned by the instructor. Problems will be solved both individually and in groups. (Capstone writing course.)

Course Attributes: WI

Repeatability: This course may not be repeated for additional credits.

Pre-requisites:

(MATH 3138|Minimum Grade of C-|May be taken concurrently

OR MATH 3142|Minimum Grade of C-|May be taken concurrently

OR MATH 3044|Minimum Grade of C-|May be taken concurrently)

AND (MATH 3096|Minimum Grade of C-|May not be taken concurrently

OR MATH 3098|Minimum Grade of C-|May not be taken concurrently)