# MATHEMATICS, BS

## Program Description

The mission of the Mathematics Program at Texas A&M University-Corpus Christi is to increase the knowledge and use of mathematics by persons both at the University and in the surrounding area. We strive to educate students at the University so that they are prepared to use mathematics intelligently in their chosen fields of study and to understand mathematics as it affects their lives and participation in public affairs. In addition, the Mathematics Program provides its majors and graduate students with preparation for careers in education, science, and commerce, as well as providing a solid foundation for further study in mathematics. In support of the graduate program, the mathematics faculty pursues scholarship in mathematics, applications of mathematics, and instruction in mathematics. Finally, the Mathematics Program serves the community by providing its expertise to local schools, industry, and businesses.

## Student Learning Outcomes

Students will:

- Demonstrate a command of principles of general mathematics at the undergraduate level.
- Recognize mathematics outside the realm of the classroom, and apply undergraduate level mathematical content as a matter of professional practice.
- Communicate mathematics effectively at the undergraduate level, in oral and written form, with appropriate use of technology.

There are three tracks for the degree: Secondary Mathematics Teaching, leading to teacher certification; Applied/Industrial Mathematics, preparing students for employment; and Data Science and Statistics Track.  All options share a common core that consists of 32 hours of mathematics, physics and programming.

## Placement and Prerequisites

Each new or transfer student entering Texas A&M University-Corpus Christi who plans to take a mathematics course will be evaluated by the University to determine the appropriate first mathematics course(s) for that student. For students who enter having successfully completed a college mathematics course, evaluation will normally be based on their college transcript. For a student who enters without having completed a college-level mathematics course, evaluation will normally be based on both that student's high-school transcript, and his or her score on standardized tests. For details on use of transcripts and scores for placement see the placement link on the Department webpage, http://math.tamucc.edu. Students may not enroll for their first mathematics course without having been placed into that course.

GPA in the major field of study for the BS in Mathematics is computed using those courses in the Mathematics Core, the Mathematics Track Requirements, and the Upper Level Math Electives.

## Teaching Certification in Mathematics

Students who wish to teach mathematics in grades 4-12 should explore the following certification options:

- Elementary Education, BS — Grades 4-8 with Mathematics Certification (https://catalog.tamucc.edu/undergraduate/education-human-development/bachelors/elementary-education-bs/#requirementstext)
- Mathematics, BS — Grades 7-12 Mathematics Education Concentration (https://catalog.tamucc.edu/undergraduate/science/teaching-certificates/mathematics-bs-grades-7-12-education-concentration/)
- Mathematics, Grades 7-12 Teacher Certification Without a Mathematics Major (https://catalog.tamucc.edu/undergraduate/science/teaching-certificates/mathematics-grades-7-12-teacher-certification-without-major/)

## Fast Track from Bachelor's to Master's Degree

The university allows the opportunity for high-achieving students to count a select number of graduate credits toward their undergraduate degree and thereby obtain a graduate degree at an accelerated pace. For more information, see Fast Track Mathematics, BS and Mathematics, MS (https://catalog.tamucc.edu/undergraduate/science/fast-track/fast-track-mathematics-bs-ms/).

## General Requirements

The requirements for a Bachelor of Science degree in Mathematics include at least 120 semester hours with a minimum of 45 upper-division hours.

| Requirements | Credit Hours |
|---|---|
| University Seminar (when applicable)[1] | 0-2 |
| Core Curriculum Program (https://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/) | 42 |
| Mathematics Core Requirements | 17 |
| Mathematics Track | 24-30 |
| Minor or Career Emphasis[2] | 18 |
| Electives (as needed to fulfill University graduation requirements)[3] | 19 |
| **Total Credit Hours** | **120-128** |

1 Full-time, first time in college students are required to take university seminar.
- USSE 1201 University Seminar (2 sch)

2 Minor or career emphasis: 18-23 hrs

3 Electives (as needed to fulfill University graduation requirements): 2-19 hrs

## Program Requirements

| Code | Title | Hours |
|---|---|---|
| **Full-time, First-year Students** [1] | | |
| USSE 1201 | University Seminar | 2 |
| **Core Curriculum Program** | | |
| University Core Curriculum | | 42 |
| Mathematics major students will use: | | |
| Life and Physical Science Foundational Component Area | | |

| | | |
|---|---|---|
| PHYS 2425 | University Physics I (lecture hours only. 1 hr laboratory applies to Component Area Option) | |
| PHYS 2426 | University Physics II (lecture hours only. 1 hr laboratory applies to Component Area Option) | |
| Mathematics Foundational Component Area | | |
| MATH 2413 | Calculus I (lecture hours only. 1 hr laboratory applies to Mathematics Core requirement) | |
| Component Area Option | | |
| MATH 2414 | Calculus II | |
| PHYS 2425 | University Physics I (lab hour only) | |
| PHYS 2426 | University Physics II (lab hour only) | |
| **Mathematics Core Requirements** | | |
| MATH 2413 | Calculus I (included in University Core) [2,3] | |
| MATH 2414 | Calculus II (included in University Core) [2] | 1 |
| MATH 3311 | Linear Algebra | 3 |
| MATH 3313 | Foundations of Number Theory | 3 |
| MATH 2415 | Calculus III | 4 |
| COSC 1330 | Programming for Scientists, Engineers, and Mathematicians [4] | 3 |
| MATH 3315 | Differential Equations | 3 |
| **Mathematics Track Requirements** | | |
| Select one of the following Tracks in consultation with the faculty mentor and with department chair approval: | | 24-30 |
| Secondary Mathematics Teaching Track (p. 2) | | |
| Applied/Industrial Mathematics Track (p. 2) | | |
| Data Science and Statistics Track (p. 2) | | |
| **Minor or Career Emphasis** | | |
| Select 18-23 hours of electives in consultation with faculty mentor (p. 2) | | 18-23 |
| **Electives** | | |
| Select electives as needed to fulfill University graduation requirements including 2 hours of Physics lab (2-19 hrs) | | 2-19 |
| **Total Hours** | | **122** |

1 After confirming with an advisor, others may take electives instead.

2 May be waived with suitable placement; see placement section below for more details. Upper-division classes may be required to increase total upper-division hours to the university minimum. See the degree requirements section of the catalog for details.

3 3 hours of MATH 2413 Calculus I (4 sch) apply to the University Core Curriculum. The 1 hour laboratory component applies to the Mathematics Core requirement.

4 May substitute COSC 1435 Introduction to Problem Solving with Computers I (4 sch) or COSC 1436 Introduction to Problem Solving with Computers II (4 sch)

## Secondary Mathematics Teaching Track

| Code | Title | Hours |
|---|---|---|
| **Track Requirements** | | |
| MATH 3312 | College Geometry | 3 |
| MATH 3314 | Foundations of Real Numbers | 3 |
| MATH 3342 | Applied Probability and Statistics | 3 |
| MATH 4306 | Modern Algebra | 3 |
| SMTE 4370 | Mathematics Education Topics I | 3 |
| Select any 9 hours of upper-division Mathematics | | 9 |
| **Total Hours** | | **24** |

## Applied/Industrial Mathematics Track

| Code | Title | Hours |
|---|---|---|
| **Track Requirements** | | |
| MATH 3314 | Foundations of Real Numbers | 3 |
| MATH 3345 | Statistical Modeling and Data Analysis | 3 |
| COSC 3385 | Numerical Methods | 3 |
| MATH 4301 | Introduction to Analysis | 3 |
| MATH 4385 | Applied Modeling | 3 |
| Select any 9 hours of upper-division Mathematics | | 9 |
| **Total Hours** | | **24** |

## Data Science and Statistics Track

| Code | Title | Hours |
|---|---|---|
| **Track Requirements** | | |
| MATH 3345 | Statistical Modeling and Data Analysis | 3 |
| or MATH 3342 | Applied Probability and Statistics | |
| MATH 3347 | Introduction to Probability | 3 |
| MATH 3349 | Principles of Data Science | 3 |
| MATH 4321 | Applied Regression Analysis | 3 |
| MATH 4342 | Introduction to Mathematical Statistics | 3 |
| COSC 4345 | Introduction to Machine Learning | 3 |
| MATH 4385 | Applied Modeling | 3 |
| Select any 9 hours of upper-division Mathematics | | 9 |
| **Total Hours** | | **30** |

## Minor or Career Emphasis

Students complete a major in mathematics with electives as needed. Mathematics majors must consult with a mathematics faculty mentor in choosing the electives and are advised to choose among two options. The first option is a minor, designed to provide a secondary concentration in an area of particular interest to the student, or of particular importance to his or her career plans. The second option designed for those students seeking secondary teaching certification, is a sequence of courses in Education. Details of each of these options are:

A minor consists of 18-23 specified semester hours in an approved subject. The student should consult the section of the catalog pertaining to the academic area of the minor for a description of the requirements in that discipline. If no description is provided, the minor is subject to the approval of the department containing the minor.

Twenty-seven hours of courses as specified by the College of Education and Human Development to meet SBEC requirements for certification. An additional 4 hours to complete a “Support Field” will be required. Consult the “Professional Development and Reading Sequence” of the BS in Mathematics—Grades 7-12 section of the SMTE portion of the catalog for more details.

# Course Sequencing

## Secondary Mathematics Teaching Track (https://catalog.tamucc.edu/undergraduate/science/teaching-certificates/mathematics-bs-grades-7-12-education-concentration/#coursesequencingtext)

## Applied/Industrial Track

**First Year**

| Fall | | Hours |
|---|---|---|
| ENGL 1301 | Writing and Rhetoric I | 3 |
| USSE 1201 | University Seminar | 2 |
| MATH 2413 | Calculus I | 4 |
| POLS 2305 | U.S. Government and Politics | 3 |
| American History Core Requirement | | 3 |
| | **Hours** | **15** |
| **Spring** | | |
| ENGL 1302 or COMM 1311 | Writing and Rhetoric II or Foundation of Communication | 3 |
| MATH 2414 | Calculus II | 4 |
| POLS 2306 | State and Local Government | 3 |
| American History Core Requirement | | 3 |
| Minor Course | | 3 |
| | **Hours** | **16** |

**Second Year**

| Fall | | |
|---|---|---|
| COSC 1330 | Programming for Scientists, Engineers, and Mathematicians | 3 |
| MATH 2415 | Calculus III | 4 |
| PHYS 2425 | University Physics I | 4 |
| MATH 3313 | Foundations of Number Theory | 3 |
| Language, Philosophy & Culture Core Requirement | | 3 |
| | **Hours** | **17** |
| **Spring** | | |
| PHYS 2426 | University Physics II | 4 |
| MATH 3315 | Differential Equations | 3 |
| MATH 3314 | Foundations of Real Numbers | 3 |
| Minor Course | | 3 |
| Creative Arts Core Requirement | | 3 |
| | **Hours** | **16** |

**Third Year**

| Fall | | |
|---|---|---|
| MATH 3311 | Linear Algebra | 3 |
| COSC 3385 | Numerical Methods | 3 |
| MATH Upper Elective | | 3 |
| Minor Course | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| | **Hours** | **15** |
| **Spring** | | |
| MATH 3345 | Statistical Modeling and Data Analysis | 3 |
| MATH Upper Elective | | 3 |
| Minor Course | | 3 |
| Social and Behavioral Sciences Core Requirement | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| | **Hours** | **15** |

**Fourth Year**

| Fall | | |
|---|---|---|
| MATH 4301 | Introduction to Analysis | 3 |
| MATH Upper Elective | | 3 |
| Minor Course | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| | **Hours** | **12** |
| **Spring** | | |
| MATH 4385 | Applied Modeling | 3 |
| Minor Course | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| | **Hours** | **15** |
| | **Total Hours** | **121** |

## Data Science and Statistics Track

**First Year**

| Fall | | Hours |
|---|---|---|
| ENGL 1301 | Writing and Rhetoric I | 3 |
| USSE 1201 | University Seminar | 2 |
| MATH 2413 | Calculus I | 4 |
| POLS 2305 | U.S. Government and Politics | 3 |
| American History Core Requirement | | 3 |
| | **Hours** | **15** |
| **Spring** | | |
| ENGL 1302 or COMM 1311 | Writing and Rhetoric II or Foundation of Communication | 3 |
| MATH 2414 | Calculus II | 4 |
| POLS 2306 | State and Local Government | 3 |
| American History Core Requirement | | 3 |
| Minor Course | | 3 |
| | **Hours** | **16** |

**Second Year**

| Fall | | |
|---|---|---|
| COSC 1330 | Programming for Scientists, Engineers, and Mathematicians | 3 |
| MATH 2415 | Calculus III | 4 |
| PHYS 2425 | University Physics I | 4 |
| MATH 3313 | Foundations of Number Theory | 3 |
| Language, Philosophy & Culture Core Requirement | | 3 |
| | **Hours** | **17** |
| **Spring** | | |
| PHYS 2426 | University Physics II | 4 |
| MATH 3315 | Differential Equations | 3 |
| MATH 3311 | Linear Algebra | 3 |
| Minor Course | | 3 |
| Creative Arts Core Requirement | | 3 |
| | **Hours** | **16** |

| | | |
|---|---|---|
| **Third Year** | | |
| **Fall** | | |
| MATH 3345 or MATH 3342 | Statistical Modeling and Data Analysis or Applied Probability and Statistics | 3 |
| MATH 3347 | Introduction to Probability | 3 |
| MATH Upper Elective | | 3 |
| Minor Course | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| | **Hours** | **15** |
| **Spring** | | |
| MATH 3349 | Principles of Data Science | 3 |
| MATH 4321 | Applied Regression Analysis | 3 |
| MATH Upper Elective | | 3 |
| Minor Course | | 3 |
| Social and Behavioral Sciences Core Requirement | | 3 |
| | **Hours** | **15** |
| **Fourth Year** | | |
| **Fall** | | |
| MATH 4342 | Introduction to Mathematical Statistics | 3 |
| COSC 4345 | Introduction to Machine Learning | 3 |
| MATH Upper Elective | | 3 |
| Minor Course | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| | **Hours** | **15** |
| **Spring** | | |
| MATH 4385 | Applied Modeling | 3 |
| Minor Course | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| Elective (to meet 120 hrs) | | 3 |
| | **Hours** | **12** |
| | **Total Hours** | **121** |

# Courses

**MATH 0099 Non-Course Based Support for Mathematics**
**0 Semester Credit Hours**
Preparation workshop to help students achieve College Readiness in mathematics under the Texas Success Initiative. Topics include five general areas: fundamental mathematics, algebra, geometry, statistics, and problem solving.

**MATH 0200 Brief Developmental Mathematics**
**1-2 Semester Credit Hours (1-2 Lecture Hours)**
Topics as in MATH 0300. For students who have completed most topics in MATH 0300. Requires permission of MATH department. (Not counted toward graduation) Fall, Spring, Maymester, Summer.
**Co-requisite:** MATH 1314, MATH 1442.

**MATH 0214 Foundational Support for College Algebra**
**2 Semester Credit Hours (2 Lecture Hours)**
This course is co-requisite course supporting for MATH 1314. Support will focus on essential skills required for success in College Algebra (Math 1314). Supporting topics include review of intermediate algebra, polynomial equations, graphing techniques, and applications. Course provides the necessary academic support for TSI liable students concurrently enrolled in MATH 1314 as the co-requisite with MATH 0214. Students who register for MATH 0214 must co-register in MATH 1314. Math 0214 is not counted toward graduation. Fall, Spring, Summer.

**MATH 0224 Brief Developmental Mathematics-Business Mathematics**
**2 Semester Credit Hours (2 Lecture Hours)**
This course is the co-requisite course supporting for MATH 1324. Support will focus on essential skills required for success in Business Math (Math 1324). Supporting topics include the use of calculators and technology. Topics focus on basic review of mathematical skills, elementary algebra, mathematical and logical reasoning, probability, and financial management, while providing the necessary academic support for TSI liable students concurrently enrolled in MATH 1324 as the co-requisite with MATH 0224. Students who register for MATH 0224 must co-register in MATH 1324. Math 0224 is not counted toward graduation. Fall, Spring, Summer.

**MATH 0232 Brief Developmental Mathematics-Contemporary Mathematics**
**2 Semester Credit Hours (2 Lecture Hours)**
This course is co-requisite course supporting for MATH 1332. Support will focus on essential skills required for success in Contemporary Mathematics (Math 1332). Supporting topics include a basic review of mathematical skills, elementary algebra, mathematical and logical reasoning, probability, and descriptive statistics, while providing the necessary academic support for TSI liable students concurrently enrolled in MATH 1332 as the co-requisite with MATH 0232. Students who register for MATH 0232 must co-register in MATH 1332. Math 0232 is not counted toward graduation. Fall, Spring, Summer.
**Co-requisite:** MATH 1332.

**MATH 0242 Foundational Support for Statistics for Life**
**2 Semester Credit Hours (2 Lecture Hours)**
This course is co-requisite course supporting for MATH 1442. Support will focus on essential skills required for success in Statistics for Life (Math 1442). Supporting topics include the use of calculators and technology. Topics focus on descriptive and inferential statistics, probabilities including notation, while providing the necessary academic support for TSI liable students concurrently enrolled in MATH 1442 as the co-requisite with MATH 0242 . Students who register for MATH 0242 must co-register in MATH 1442. Math 0242 is not counted toward graduation. Fall, Spring, Summer.
**Co-requisite:** MATH 1442.

**MATH 0300 Developmental Mathematics**
**3 Semester Credit Hours (3 Lecture Hours)**
Topics include number concepts, computation, elementary algebra, geometry, and mathematical reasoning. Also, linear equations and inequalities, rational expressions, exponents and radicals, quadratics and word problems. May be repeated for credit as needed to complete mastery of all topics. (Not counted toward graduation.) Fall, Spring, Summer.

**MATH 0310 Development Mathematics-Algebra**
**3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)**
3 sem. hrs. (2:2) Topics include number concepts, computation, elementary algebra, and geometry. Also, linear equations and inequalities, rational expressions, exponents and radicals, quadratics and word problems. May be repeated for credit as needed to complete mastery of all topics. (Not counted toward graduation.) Fall, Spring, Summer.

**MATH 0398 Introduction to Algebra**
**3 Semester Credit Hours (3 Lecture Hours)**
Number concepts, computation, elementary algebra, geometry, and mathematical reasoning.

**MATH 0399 Intermediate Algebra**
**3 Semester Credit Hours (3 Lecture Hours)**
Topics include linear equations and inequalities, rational expressions, exponents and radicals, quadratics and word problems.
**Prerequisite:** MATH 0398.

**MATH 1014 Essential Support for College Algebra for STEM Majors**
**0 Semester Credit Hours**
Focuses on essential skills required for success in College Algebra for STEM majors (Math 1314-designated sections). Students who register for MATH 1014 must co-register in MATH 1314 sections designated with S. Math 1014 is not counted toward graduation. Fall, Spring, Summer.
**Co-requisite:** MATH 1314.

**MATH 1024 Essential Support for Business Math**
**0 Semester Credit Hours**
Supports MATH 1324 with focus on essential skills required for success in Business Math, and providing the necessary academic support for TSI liable students concurrently enrolled in MATH 1324. Students who register for MATH 1024 must co-register in MATH 1324. Math 1024 is not counted toward graduation. Fall, Spring, Summer.

**MATH 1025 Essential Support for Business Calculus**
**0 Semester Credit Hours**
Supports MATH 1325 with focus on essential skills required for success in Business Calculus (Math 1325). Students who register for MATH 1025 must co-register in MATH 1325. Math 1025 is not counted toward graduation. Fall, Spring, Summer.

**MATH 1314 College Algebra**
**3 Semester Credit Hours (3 Lecture Hours)**
Quadratic equations, inequalities, graphs, logarithms and exponentials, theory of polynomial equations, systems of equations by using matrix. Counts as the mathematics component of the University Core Curriculum. Fall, Spring, Summer. Students in STEM programs must register in sections with S designation. Meets 3 hours per week with one meeting per week in MATH 1014.
**TCCNS:** MATH 1314

**MATH 1316 Trigonometry**
**3 Semester Credit Hours (3 Lecture Hours)**
Trigonometric functions, identities, equations involving trigonometric functions, solutions of right and oblique triangles.
**Prerequisite:** (MATH 1314, 1314, minimum score of 550 in 'SAT MATH SECTION' or minimum score of 21 in 'ACT1 Math') or minimum score of 21 in 'ACT Math'.
**TCCNS:** MATH 1316

**MATH 1324 Mathematics for Business and Social Sciences**
**3 Semester Credit Hours (3 Lecture Hours)**
Students will learn how the properties and language of mathematics can be used in business and real-world problem solving and understand the techniques and applications of finance problems, basic matrix operation, basic counting principles, probability analysis in modeling real-world scenarios, and review of Algebra topics. Three lecture hours plus one discussion session a week in corequisite (MATH 1024) This course could be taught in 14-weeks or 7-weeks semesters, and in F2F or fully online formats. May not be counted toward a degree in the Colleges of Science or Engineering. Fall, Spring Summer.
**TCCNS:** MATH 1324

**MATH 1325 Calculus for Business & Social Sciences**
**3 Semester Credit Hours (3 Lecture Hours)**
Students will develop and combine the concepts in and relationships between Mathematics and Business from the fundamentals of calculus and optimization in all Business fields. Students are expected to learn the materials algebraically with technology. Students will combine the concepts of limits, continuity, differentiation and integration techniques to solve problems in business, economics, and social sciences. Three lecture hours plus one discussion session a week in MATH 1025. This course could be taught in 14-weeks and 7-weeks semesters in F2F and fully online formats. May not be counted toward a degree in the Colleges of Science or Engineering. Fall, Spring, Summer.
**Prerequisite:** MATH 1324, minimum score of 550 in 'SAT MATH SECTION', minimum score of 21 in 'ACT1 Math' or minimum score of 21 in 'ACT Math'.
**TCCNS:** MATH 1325

**MATH 1332 Contemporary Mathematics**
**3 Semester Credit Hours (3 Lecture Hours)**
This course serves as a terminal course and supplies a brief overview of several topics in mathematics. Topics may include introductory treatments of sets, logic, number systems, number theory, relations, functions, probability and statistics. Appropriate applications are included. This course emphasizes using critical thinking to make decisions based on information.
**TCCNS:** MATH 1332

**MATH 1390 Introduction to Mathematical Topics**
**1-3 Semester Credit Hours (1-3 Lab Hours)**
A course to introduce students to mathematical topics in a formal setting. The course may support problem solving, or systematic investigations of topics outside the current mathematical catalog. May not be substituted for regularly scheduled offerings.

**MATH 1442 Statistics for Life**
**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**
An introduction to statistical concepts and methods used in all disciplines to enhance decision making based on data analysis, including: basic experimental design models, measurement and data collection through sampling; display and summary of information, and assessment of relationship through descriptive techniques; probability concepts leading to estimation and hypothesis testing of means, variance and proportions, regression analysis, one-factor ANOVA and chi-square test of independence; and applications through case studies. The laboratory component of the course offers applications of the theory presented during the classroom sessions.
**TCCNS:** MATH 1442

**MATH 2305 Discrete Mathematics I**
**3 Semester Credit Hours (3 Lecture Hours)**
An introduction to topics in Discrete Mathematics with an emphasis on applications in Mathematics and Computer Science. Topics include formal logic, graphs, trees and related algorithms, and combinatorics and discrete probability.
**Prerequisite:** MATH 2413*, 2413*, minimum score of 620 in 'SAT Math', minimum score of 620 in 'SAT1 Mathematics', minimum score of 640 in 'SAT MATH SECTION', minimum score of 27 in 'ACT Math' or minimum score of 27 in 'ACT1 Math'.
* May be taken concurrently.
**TCCNS:** MATH 2305

**MATH 2312 Precalculus**
**3 Semester Credit Hours (3 Lecture Hours)**
A more rapid treatment of the material in MATH 1314 and MATH 1316, this course is designed for students who wish a review of the above material, or who are very well prepared. Functions, graphs, trigonometry, and analytic geometry.
**Prerequisite:** MATH 1314, 1314, minimum score of 550 in 'SAT MATH SECTION', minimum score of 21 in 'ACT Math' or minimum score of 21 in 'ACT1 Math'.
**TCCNS:** MATH 2312

**MATH 2413 Calculus I**
**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**
Limits, continuity, derivatives, applications of the derivative, and an introduction to integrals. Contains a laboratory component.
**Prerequisite:** MATH 1316, 1316, 2312, 2312, minimum score of 640 in 'SAT MATH SECTION' or minimum score of 27 in 'ACT1 Math'.
**TCCNS:** MATH 2413

**MATH 2414 Calculus II**
**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**
Techniques of integration, applications of integrals, sequences, series, Taylor polynomials and series. Parametric equations. Contains a laboratory component.
**Prerequisite:** MATH 2413 or 2413.
**TCCNS:** MATH 2414

**MATH 2415 Calculus III**
**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**
Vectors and space curves, partial derivatives, multiple integrals, special coordinate systems, line and surface integrals, Green's, Stokes', and the Divergence Theorems. Contains a laboratory component. Vectors and space curves, partial derivatives, multiple integrals, special coordinate systems, line and surface integrals, Green's, Stokes', and the Divergence Theorems. Contains a laboratory component.
**Prerequisite:** MATH 2414 or 2414.
**TCCNS:** MATH 2415

**MATH 3300 Geospatial Mathematical Techniques**
**3 Semester Credit Hours (3 Lecture Hours)**
Characteristics of geographic/spatial information; overview of relevant sections of numbers, algebra and geometry, plane and spherical trigonometry, matrices, determinants and vectors, curves and surfaces, integral and differential calculus, partial derivatives, with an emphasis on geospatial applications. Concepts of geospatial coordinate systems and geospatial coordinate transformations; overview of spatial statistics and best-fit solutions with geospatial applications. Students may not receive credit for both MATH 3300 and GISC 3300.
**Prerequisite:** MATH 2413 and 2414.

**MATH 3301 Introduction to Complex Analysis**
**3 Semester Credit Hours (3 Lecture Hours)**
This course introduces functions of a complex variable and their applications. Contents include differentiation and integration; zeros, poles and residues; conformal mappings.
**Prerequisite:** (MATH 2415 or 2415) or (MATH 2414 or 2414 and MATH 3314 or 3314).

**MATH 3310 Mathematical Analysis for Mechanical Engineering**
**3 Semester Credit Hours (3 Lecture Hours)**
Applications of fundamentals of linear algebra, vector analysis, numerical methods, computer programming and probability and statistics into mechanical engineering. May not count towards the MATH major. Students may not receive credit for both MATH 3310 and MEEN 3310.
**Prerequisite:** MATH 3315.

**MATH 3311 Linear Algebra**
**3 Semester Credit Hours (3 Lecture Hours)**
Fundamentals of linear algebra and matrix theory. Topics include vectors, matrix operations, linear transformations, fundamental properties of vector spaces, systems of linear equations, eigenvalues and eigenvectors. Applications.
**Prerequisite:** MATH 2413 or 2413.

**MATH 3312 College Geometry**
**3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)**
A careful study of the foundations of Euclidean geometry by synthetic methods with an introduction to non-Euclidean geometries. An introduction to transformational geometry.
**Prerequisite:** MATH 2413 or 2413.

**MATH 3313 Foundations of Number Theory**
**3 Semester Credit Hours (3 Lecture Hours)**
This course assists a student's transition to advanced mathematics. Fundamentals of logic and proof are reviewed and applied to topics from elementary number theory.
**Prerequisite:** MATH 2414 or 2414.

**MATH 3314 Foundations of Real Numbers**
**3 Semester Credit Hours (3 Lecture Hours)**
This course assists a student's transition to advanced mathematics. Fundamentals of logic and proof are reviewed and applied to development of the real number line.
**Prerequisite:** MATH 2414.

**MATH 3315 Differential Equations**
**3 Semester Credit Hours (3 Lecture Hours)**
An introduction to both theoretical and applied aspects of ordinary differential equations. Topics include: first order equations, linear second order equations, elementary numerical methods, and the Laplace transform.
**Prerequisite:** MATH 2414 or 2414.

**MATH 3342 Applied Probability and Statistics**
**3 Semester Credit Hours (3 Lecture Hours)**
A calculus based introduction to probability and statistics. Emphasis will be on development of statistical thinking and working with data. Topics include probability theory, descriptive statistics, common distributions, and statistical inference.
**Prerequisite:** MATH 2413 or 2413.

**MATH 3345 Statistical Modeling and Data Analysis**
**3 Semester Credit Hours (3 Lecture Hours)**
An introduction to probability/statistical modeling and data analysis techniques to investigate data. Topics include: exploratory data analysis, probability models and simulation, sampling distributions, statistical inference. Applications to real world problems. Students will be expected to present and justify results orally and in writing. Note: MATH 3342 and MATH 3345 cannot both be counted for credit.
**Prerequisite:** MATH 2413 or 2413 and (COSC 1330, 1330, 1435, 1435 or 1320).

**MATH 3347 Introduction to Probability**
**3 Semester Credit Hours (3 Lecture Hours)**
This is an introduction to probability. In the course, key fundamental concepts of probability, random variables and their distributions, expectations, and conditional probabilities will be covered. Topics include counting rules, combinatorial analysis, sample spaces, axioms of probability, conditional probability and independence, discrete and continuous random variables, jointly distributed random variables, characteristics of random variables, law of large numbers and central limit theorem, random processes, Markov chains, Markov chain-Monte Carlo, Poisson Process and Entropy.
**Prerequisite:** MATH 2415.

**MATH 3349 Principles of Data Science**
**3 Semester Credit Hours (3 Lecture Hours)**
Combining data, computation, and inferential thinking, data science is redefining how people and organizations solve challenging problems and understand their world. This class bridges computer science, statistics, and mathematics courses as well as methods courses in other fields. In this class, we explore key areas of data science including question formulation, data collection and cleaning, visualization, predictive modeling, and decision making. Through a strong emphasis on data centric computing, quantitative critical thinking, and exploratory data analysis, this class covers key principles and techniques of data science. These include languages for transforming, querying and analyzing data; algorithms for machine learning methods including regression, classification and clustering, principles behind creating informative data visualizations, and techniques for scalable data processing.
**Co-requisite:** MATH 3311.

**MATH 3385 Linear Optimization and Decisions**
**3 Semester Credit Hours (3 Lecture Hours)**
This course introduces the linear programming and optimization problems arising in many applications. Contents include linear programming models with solutions, the simplex method, duality theory and its use for management decision making, dual simplex method and sensitivity analysis.
**Prerequisite:** MATH 3311 and 2413.

**MATH 3390 Problem Solving in Mathematics**
**1-3 Semester Credit Hours (1-3 Lecture Hours)**
A problem solving course for students who want to participate in math problem solving competitions, train for the actuarial or other professional examinations, work on research aimed at conference presentations, or perform research projects at the junior level that are not at the level of directed independent study material.
**Prerequisite:** MATH 2414.

**MATH 4185 Senior Mathematics Seminar**
**1 Semester Credit Hour (1 Lecture Hour)**
This course introduces a weekly mathematics seminar. Students will generate a viable project for the capstone course.

**MATH 4285 Mathematics Major Capstone**
**2 Semester Credit Hours (2 Lecture Hours)**
Development of projects as proposed in MATH 4185, as well as mathematics communication skills. Students will present their projects, and take a national level assessment.
**Prerequisite:** MATH 4185.

**MATH 4301 Introduction to Analysis**
**3 Semester Credit Hours (3 Lecture Hours)**
An advanced treatment of the foundations of calculus stressing rigorous proofs of theorems. Topics include: elements of propositional and predicate logic, topology of the real numbers, sequences, limits, the derivative, and the Riemann integral.
**Prerequisite:** MATH 2415 or 2415 and MATH 3314 or 3314.

**MATH 4306 Modern Algebra**
**3 Semester Credit Hours (3 Lecture Hours)**
Fundamentals of set operations, maps and relations, groups, rings and field theory. Topics include permutation groups, cosets, homomorphisms and isomorphisms, direct product of groups and rings, integral domains field of quotients, fundamental properties of integers, the ring of integers modulo n, and rings of polynomials. Applications.
**Prerequisite:** MATH 3311 and 3313.

**MATH 4312 Differential Geometry**
**3 Semester Credit Hours (3 Lecture Hours)**
Differential forms on R1, R2, R3, and Rn; Integration and differentiation of differential forms; Stokes' Theorem; manifolds; Gaussian curvature and the Gauss-Bonnet Theorem.
**Prerequisite:** MATH 2415.

**MATH 4315 Partial Differential Equations**
**3 Semester Credit Hours (3 Lecture Hours)**
An introduction to partial differential equations emphasizing the wave, diffusion and potential (Laplace) equations. A focus on understanding the physical meaning and mathematical properties of solutions of partial differential equations. Methods include fundamental solutions and transform methods for problems on the line, and separation of variables using orthogonal series for problems in regions with boundary. Additional topics include higher dimensional problems and special topics like Harmonic functions, the maximum principle, Green's functions etc.
**Prerequisite:** MATH 3315 and 2415.

**MATH 4321 Applied Regression Analysis**
**3 Semester Credit Hours (3 Lecture Hours)**
Introduction to the formulation of linear models and the estimation of the parameters of such models, with primary emphasis on least squares. Application of multiple regression and curve fitting and the design of experiments for fitting regression models.
**Prerequisite:** MATH 1342, 2342 or 1470.

**MATH 4328 Discrete Mathematics II**
**3 Semester Credit Hours (3 Lecture Hours)**
A continued study of topics from Discrete Mathematics I with additional topics from discrete mathematics that have strong application to the field of computer science. Additional topics include: recurrence relations, formal languages, and finite-state machines.
**Prerequisite:** MATH 2305 and COSC 2437.

**MATH 4339 Advanced Numerical Methods**
**3 Semester Credit Hours (3 Lecture Hours)**
This one-semester numerical analysis course introduces various topics in computational mathematics. Students will learn about the following topics in the course. (1) Floating point arithmetic, (2)Root finding methods and Newton methods, (3) Interpolation - polynomial (Lagrange and Hermite), Trigonometric, and Spline, (4) Numerical Differentiation and Integration, (5) Solution of linear systems -- direct and iterative methods of solving both linear and nonlinear systems, and (6) Numerical methods for ordinary differential equations. NOTE: This course is intended for students in the College of Science. MATH 2413, MATH 2414, and MATH 3311 with grades C or better. Basic programming knowledge, whether Python or Matlab, is required.
**Prerequisite:** MATH 2413, 2414 and 3311.

**MATH 4342 Introduction to Mathematical Statistics**
**3 Semester Credit Hours (3 Lecture Hours)**
This is a first course in mathematical statistics, topics include: moment-generating functions, functions of random variables, sampling distributions, methods of estimation including Bayesian estimation, characteristics of estimators, interval estimation, hypothesis testing, Neyman-Pearson Lemma, likelihood ratio test, tests involving means and variances, regression and correlation, multiple linear regression, introduction to ANOVA, non-parametric tests.
**Prerequisite:** MATH 2415.

**MATH 4385 Applied Modeling**
**3 Semester Credit Hours (3 Lecture Hours)**
Capstone course for mathematics majors. The construction of mathematical models from areas such as economics, refining, biology and mariculture, etc. Where possible, local phenomena will be modeled with the assistance of outside consultants.
**Prerequisite:** MATH 3315 and 3342 or MATH 3345.

**MATH 4390 Selected Topics**
**3 Semester Credit Hours (3 Lecture Hours)**
Offered on sufficient demand.

**MATH 4696 Directed Independent Study**
**1-6 Semester Credit Hours**
See college description.