

# MATHEMATICS, BS - GRADES 7-12 MATHEMATICS EDUCATION CONCENTRATION

## Program Description

### Introduction

The College of Science and Engineering is committed to the support of students seeking to become science, mathematics and technology educators at all levels. The Science, Mathematics and Technology Education (SMTE) program offers content courses for students seeking K-12 science, mathematics and technology education. SMTE classes are also an integral part of the course work for degrees preparing students for Teacher Certifications. The SMTE program does not offer a degree; rather, degrees leading to Teacher Certification are offered by other Science and Technology programs and by the College of Education and Human Development. Students seeking to teach in the elementary and secondary schools of Texas must meet degree requirements as well as certification requirements. The requirements and procedure to become a science, mathematics or technology teacher in Texas are outlined below. Undergraduate students who are graduating from the College of Science & Engineering or the College of Liberal Arts who are seeking initial teacher certification at the 4-8, 7-12 and EC-12 levels prior to graduation, automatically qualify for the Minor in Education.

### How to Become a Science, Mathematics or Technology Teacher in Texas

In order to be recommended for teacher certification at this university, a candidate must fulfill three basic requirements:

1. have a bachelor's degree from an accredited college or university that includes an academic major and teacher training courses,
2. complete teacher training through an approved program, and
3. successfully complete the appropriate teacher certification tests for the subject and grade level that the candidate wishes to teach.

Additional information on the requirements to become a teacher in Texas can be obtained at the State Board of Educator Certification (SBEC) website: <http://www.sbec.state.tx.us/SBECOnline/certinfo/becometeacher.asp>. This website also provides information on the resources available to help students pay for a teacher training program.

SBEC has approved three levels of teacher certification for regular educators:

1. Early childhood to grade 6 which includes foundation subjects and enrichment areas such as art, PE, and music,
2. Grade 4-8 which includes the foundation areas only, and
3. Grade 7-12 certification.

Students can find information on the different certifications at the official Texas Examinations of Educator Standards (TExES) Web site: <http://www.texas.ets.org>. Texas A&M University-Corpus Christi offers several degrees leading to a number of these teacher certifications. The College of Education and Human Development offers several degrees leading to teacher certification. The College of Science and Engineering offers bachelor's degrees leading to teacher certification in the sciences, mathematics and technology at the 4-8 and the 7-12 levels:

- Biology, BS - Grades 7-12 Life Science Education Concentration (<http://catalog.tamucc.edu/undergraduate/science/teaching-certificates/biology-bs-grades-7-12-life-science-education-concentration/>) (120-122 sem. hrs.)
- Chemistry, BS - Grades 7-12 Physical Science Education Concentration (<http://catalog.tamucc.edu/undergraduate/science/teaching-certificates/chemistry-bs-grades-7-12-physical-science-education-concentration/>) (126-128 sem. hrs.)
- Environmental Science, BS - Grades 4-8 Science Education Concentration (<http://catalog.tamucc.edu/undergraduate/science/teaching-certificates/environmental-science-bs-grades-4-8-science-education-concentration/>) (125-130 sem. hrs.)
- Elementary Education, BS - Grades 4-8 with Mathematics Certification (<http://catalog.tamucc.edu/undergraduate/science/teaching-certificates/elementary-education-bs-grades-4-8-mathematics-certification/>) (College of Education and Human Development)
- **Mathematics, BS – Grades 7-12 Mathematics Education Concentration** (120 sem. hrs.) Details immediately follow below.

Mathematics 7-12 teacher certification is also possible with an undergraduate major other than mathematics. Details can be found in the Mathematics, Grades 7-12 Teacher Certification Without a Mathematics Major (<http://catalog.tamucc.edu/undergraduate/science/teaching-certificates/mathematics-grades-7-12-teacher-certification-without-major/>) section.

The individual programs, Biology, Chemistry, Environmental Science, and Mathematics offer these degrees and courses.

Students seeking Teacher Certification are also strongly urged to contact the Certification Officer in the College of Education and Human Development about current requirements and procedures that must be met to obtain the certificate. In particular, students following a degree plan leading to teacher certification must be admitted to the Teacher Education Program at Texas A&M University-Corpus Christi **prior** to enrolling in any 4000 level EDCI or EDUC courses. Application forms for admission to the teacher education program may be obtained from the Undergraduate or Certification Office, room FC 201. The students are referred to the College of Education and Human Development section of this catalog for more information on the Teacher Education Program.

### Grade Point Average for Admission to Teacher Education

A minimum grade point average of 2.75 (4.0 = A) in all work attempted, a minimum grade point average of 2.75 in all science, math, or specialization areas, and no grade below "C" in any science or mathematics course on a student's degree plan and/or education courses within the professional block of courses are required. (See College of Education and Human Development, "Admission to Teacher Education" and "Admission to Student Teaching" for other requirements.)

### Alteration of a Certification Plan

Any amendment to a degree plan originally filed must be approved by the student's academic advisor, the Department Chair, the Dean of the College of Science and Engineering, and the Certification Officer of the College of Education and Human Development for the degree to be granted.

### General Requirements

This plan is designed for those students who desire a Bachelor of Science Degree in Mathematics and a secondary teaching certificate in mathematics. The requirements for a Bachelor of Science in Mathematics degree are a minimum of 120 semester hours. Forty-two are designated

University core curriculum courses; 38 are mathematics courses. All students must take the Major Field Test in Mathematics their senior year, prior to graduation.

Requirements	Credit Hours
Core Curriculum Program ( <a href="http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/">http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/</a> )	42
First-Year Seminars (when applicable) <sup>1</sup>	0-2
Mathematics Core	17
Mathematics Electives	6
Supporting Courses	8
Psychology Course (hours counted in Core Curriculum Program)	(3)
Professional Development and Reading Sequence	27
Electives (as needed to fulfill University graduation requirements)	20
<b>Total Credit Hours</b>	<b>120-122</b>

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Full-time, first time in college students are required to take the first-year seminars.

- UNIV 1101 University Seminar I (1 sch)
- UNIV 1102 University Seminar II (1 sch)

## Program Requirements

Code	Title	Hours
<b>Full-time, First-year Students</b>		
UNIV 1101	University Seminar I	1
UNIV 1102	University Seminar II	1
<b>Core Curriculum Program</b>		
University Core Curriculum		42
Students must take: <sup>1</sup>		
MATH 2413	Calculus I	
PHYS 2425	University Physics I	
PHYS 2426	University Physics II	
<b>Mathematics Core</b>		
MATH 2413	Calculus I (1 hour laboratory component) <sup>2,3</sup>	1
MATH 2414	Calculus II <sup>2</sup>	
MATH 3311	Linear Algebra	3
MATH 3313	Foundations of Number Theory	3
MATH 2415	Calculus III <sup>4</sup>	4
COSC 1330	Programming for Scientists, Engineers, and Mathematicians	3
MATH 3315	Differential Equations	3
<b>Mathematics Electives</b>		
MATH 3312	College Geometry	3
Select one of the following:		
MATH 4315	Partial Differential Equations	
MATH 4328	Discrete Mathematics II	
MATH 4342	Introduction to Mathematical Statistics	

SMTE 4370	Mathematics Education Topics I	
<b>Supporting Courses</b>		
COSC 1435	Introduction to Problem Solving with Computers I	4
COSC 1436	Introduction to Problem Solving with Computers II	4
<b>Psychology</b>		
PSYC 2301	General Psychology (hours counted in Core Curriculum Program)	
<b>Professional Development and Reading Sequence</b>		
<i>Preliminary Courses</i>		
READ 3353	Content Area Reading for Secondary Students	3
EDUC 3311	School and Society	3
<i>Field-Based Semester</i>		
EDUC 4605	Planning, Teaching, Assessment and Technology	6
EDUC 4321	Instructional Design for Special Populations	3
<i>Student Teaching Semester</i>		
EDUC 4311	Classroom Management	3
EDUC 4995	Clinical Teaching	9
<b>Elective</b>		
Electives (as needed to fulfill University graduation requirements 2-20 hrs)		20
<b>Total Hours</b>		<b>122</b>

1

Only 3 hours of these courses will apply to the University Core Curriculum. The three 1 hour laboratory components apply to the Mathematics Core or Supporting Courses requirement.

2

May be waived with suitable placement; see placement section below for more details. Upper-division classes may be required to increase total 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 major 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).

## Supporting Courses

Supporting courses are chosen to provide a context in which to apply mathematics, to provide important career skills for the mathematician, and to motivate many of the important problems studied in mathematics.

## Professional Development and Reading Sequence

Students who seek a 7-12 level Mathematics teaching certificate should contact a Certification Officer in the College of Education and Human Development about requirements and procedures that must be met to obtain the certificate. The professional development sequence must be taken in a specific order and it is recommended that students contact the College of Education and Human Development early in their academic careers for specific details on these courses.

## Course Sequencing

Course	Title	Hours
<b>First Year</b>		
<b>Fall</b>		
UNIV 1101	University Seminar I	1
MATH 2413	Calculus I	4
COSC 1435	Introduction to Problem Solving with Computers I	4
Communication Core Requirement		3
American History Core Requirement		3
<b>Hours</b>		<b>15</b>
<b>Spring</b>		
UNIV 1102	University Seminar II	1
MATH 2414	Calculus II	4
Communication Core Requirement		3
American History Core Requirement		3
COSC 1436	Introduction to Problem Solving with Computers II	4
<b>Hours</b>		<b>15</b>
<b>Second Year</b>		
<b>Fall</b>		
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
<b>Hours</b>		<b>17</b>
<b>Spring</b>		
PHYS 2426	University Physics II	4
MATH 3315	Differential Equations	3
PSYC 2301	General Psychology	3
Creative Arts Core Requirement		3
MATH 3311	Linear Algebra	3
<b>Hours</b>		<b>16</b>
<b>Third Year</b>		
<b>Fall</b>		
MATH 3312	College Geometry	3
Math approved upper elective		3
READ 3353	Content Area Reading for Secondary Students	3
POLS 2305	U.S. Government and Politics	3
Elective (to meet 120 hrs)		3
<b>Hours</b>		<b>15</b>
<b>Spring</b>		
MATH 4315 or MATH 4328 or MATH 4342 or SMTE 4370	Partial Differential Equations or Discrete Mathematics II or Introduction to Mathematical Statistics or Mathematics Education Topics I	3
EDUC 3311	School and Society	3
POLS 2306	State and Local Government	3
Elective (to meet 120 hrs)		3

Elective (to meet 120 hrs)		3
<b>Hours</b>		<b>15</b>
<b>Fourth Year</b>		
<b>Fall</b>		
EDUC 4605	Planning, Teaching, Assessment and Technology	6
EDUC 4321	Instructional Design for Special Populations	3
Elective (to meet 120 hrs)		3
Elective (to meet 120 hrs)		3
Elective (to meet 120 hrs)		3
<b>Hours</b>		<b>18</b>
<b>Spring</b>		
EDUC 4311	Classroom Management	3
EDUC 4995	Clinical Teaching	9
<b>Hours</b>		<b>12</b>
<b>Total Hours</b>		<b>123</b>

## Courses

### MATH 0099 Math Non-Course Based Development

#### 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 Brief Developmental Mathematics-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.

**Co-requisite:** MATH 1314.

### 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.

**Co-requisite:** MATH 1324.

**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 Brief Developmental Mathematics-Statistics****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 1314 College Algebra****3 Semester Credit Hours (3 Lecture Hours)**

Quadratic equations, inequalities, graphs, logarithms and exponentials, theory of polynomial equations, systems of equations.

**Prerequisite:** MATH 0300, minimum score of 530 in 'SAT MATH SECTION', minimum score of 19 in 'ACT1 Math', MATH 0320, minimum score of 350 in 'TSI Math', minimum score of 910 in 'TSIA2 Math' or minimum score of 6 in 'TSIA2 Math Diagnostic'.

**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, 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, and probability analysis in modeling real-world scenarios. This course could be taught in 14-weeks 7-weeks semesters and in F2F or fully online formats

**Prerequisite:** 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 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, continuation, differentiation and integration techniques to solve problems in business, economics, and social sciences. This course could be taught in 14-weeks and 7-weeks semesters in F2F and fully online formats

**Prerequisite:** (MATH 1324 and 1314).

**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.

**Prerequisite:** MATH 0300, minimum score of 530 in 'SAT MATH SECTION', minimum score of 19 in 'ACT1 Math', MATH 0310, 0320, minimum score of 350 in 'TSI Math' or minimum score of 19 in 'ACT Math'.

**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, 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'.

**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, 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, 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.

**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.

**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 (MATH 2414 and 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.

**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.

**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.

**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.

**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.

**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.

**Prerequisite:** MATH 2413 and (COSC 1330 or 1435).

**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 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 and 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  $R^1$ ,  $R^2$ ,  $R^3$ , and  $R^n$ ; 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 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.