MATHEMATICS (MATH)

The Mathematics Program:

1. Provides challenging experiences in Mathematics, Physics, and Physical Science, which prepare graduates to pursue additional study in graduate, medical/dental, and other professional schools.
2. Provides opportunities for all students to develop quantitative and problem-solving skills.
3. Provides experiences that enable graduates to find employment in science-related careers.
4. Provides opportunities for majors to complete a cooperative education experience in their disciplines.

Objectives

1. To improve critical thinking and problem-solving skills of all students.
2. To prepare department majors for medical/dental, graduate, and professional schools.
3. To provide quality general education courses that produce students with skills required for successful careers.

Specific Competencies/Skills

1. Knowledge of the major concepts in Physics, Physical Science, and Mathematics.
2. Proficiency in scientific writing, oral and visual presentations, and computer applications.
3. Proficiency in data analysis and statistical procedures.
4. Application of research techniques.
5. Proficiency in using equipment and technology in areas of the major field

Requirements for a Bachelor of Arts Degree in Mathematics (35 hours)

Required Courses

MATH 2413	Calculus 1	4 hours
MATH 2414	Calculus 2	4 hours
MATH 2415	Calculus 3	4 hours
MATH 3333	Probability	3 hours
MATH 2318	Linear Algebra	3 hours
MATH 4147	Senior Seminar (Fall and Spring)	2 hours

In addition Math majors are to select any five (5) courses from those listed below:

MATH 3334	General Topology	3 hours
MATH 1348	Geometry	3 hours
MATH 3398	Number Theory	3 hours
MATH 3331	Modern Algebra	3 hours
MATH 3337	Real Analysis	3 hours
MATH 3332	Complex Analysis	3 hours
MATH 2320	Differential Equations	3 hours
MATH 3335	Numerical Analysis	3 hours
MATH 2417	Advanced Calculus	3 hours
MATH 3338	Special Topics	3 hours

Requirements for a Bachelor of Science Degree in Mathematics

1. The required courses for a Bachelor of Arts degree
2. Eight (8) hours of Physics PHYS 2425* and PHYS 2426
3. Four (4) additional hours from CHEM 1411*, BIOL 1410*, or BIOL 1411*
4. Two (2) course selected from:
   MATH 2305 Discrete Mathematics
   MATH 1342 Introduction to Statistics
   COSC 1312 Programming Foundations I and
   COSC 1323 Programming Foundations II

Requirements for a Minor in Mathematics (20 hours)

1. MATH 2413 Calculus I and MATH 2414 Calculus II
2. An additional 12 semester hours selected from MATH 1342, MATH 2415, MATH 3333, and MATH 2318.

Students transferring from another University, please reference division requirements listed under the Department of Natural Sciences.

A SUGGESTED COURSE SEQUENCE FOR THE MATHEMATICS MAJOR

YEAR 1

FALL		SPRING	
Language I	3	Language II	3
MATH 1316 Alg. and Trig. for Science Mjrs.	3	MATH 2312 Pre-Calculus	3
ENGL 1301 Intro. College Composition	3	ENGL 1302 College Rhetoric & Composition	3
COSC 1300 Introduction to Computers	3	KINE 1304 Health and Wellness	3
KINE 1100/1101 Personal Fitness/Sports	1	PSCI 1301 US Government	3
Total Hours	13	Total Hours	15

YEAR 2

FALL		SPRING	
MATH 2413 Calculus I	4	MATH 2414 Calculus II	4
PHYS 2425 Physics I	4	^PHYS 2426 Physics II	4
COMM 1315 Public Speaking	3	Behavioral Science	3
HIST 1301/1302 U.S. History I or II	3	PHIL 2301 Philosophy and Ethics or RELI 2302 Comparative Religion	3
Total Hours	14.5	Total Hours	14.5

YEAR 3

FALL		SPRING	
MATH 2415 Calculus III	4	MATH 2320 Differential Equations	3
MATH 2318 Linear Algebra	3	MATH 3333 Probability	3
MATH 1342 or COSC 1312 (BS Elective)	3	^MATH 2305 or COSC 1323 (BS Elective)	3
Diversity Core I	3	Diversity Core II	3
Fine Arts Core	3	ENGL 2331 World Literature	3
Total Hours	16.5	Total Hours	15.5

YEAR 4

FALL		SPRING	
MATH 3337 Real Analysis	3	MATH 3338 Special Topics	3
MATH 4147 Senior Seminar	1	MATH 4147 Senior Seminar	1
MATH 3332 Modern Algebra	3	MATH 3335 Numerical Analysis	3
CHEM 1411/BIOL 1410/BIOL 1411 (BS Elec)	4	Electives (at least 8 hours)	8
Elective (at least 3 hours)	3		
Total Hours	14	Total Hours	15

^ Required course for the Bachelors of Science Degree

COURSES IN MATHEMATICS (MATH)

MATH 0330 Introduction to Algebra **3 Credit Hours**

The required competencies for successful completion of this course require demonstration of MATH 0330 competencies related to real numbers, linear equations, inequalities, and factoring polynomials. Students must pass this course with a grade of "C" or better to enroll in MATH 1314.

Offered: Fall/Spring Yearly

MATH 0330Q Introduction to Algebra with Review 3 Credit Hours
This is a five-day per week intensive course combining review of basic math skills with MATH 0330 content. The basic math concepts reviewed include operations of whole numbers, fractions and decimals, ratios and percents, rounding, prime numbers, factors and least common multiples. The required competencies for successful completion of this course require demonstration of MATH 0330 competencies related to real numbers, linear equations, inequalities, and factoring polynomials. Students must pass this course with a grade of "C" or better to enroll in MATH 1314.

Offered: Fall/Spring Yearly

MATH 1314 College Algebra 3 Credit Hours
Successful completion of this course requires demonstration of MATH 1314 competencies related to operations on algebraic expressions, functions, linear equations, inequalities, factoring polynomials and logarithms.
Prerequisite: Entrance Exam Placement or C or better in MATH 0330 or MATH 0330Q **Offered: Fall/Spring Yearly**

MATH 1314Q College Algebra with Review 3 Credit Hours
This is a five day per week intensive course combining review of MATH 0330 concepts with MATH 1314 content. The introduction to algebra concepts reviewed includes real numbers, linear equations, inequalities, and factoring polynomials. Successful completion of this course requires demonstration of MATH 1314 competencies related to operations on algebraic expressions, functions, linear equations, inequalities, factoring polynomials and logarithms.
Prerequisite: Entrance Exam Placement or C or better in MATH 0330 or MATH 0330Q **Offered: Fall/Spring Yearly**

MATH 1316 Algebra and Trigonometry for Science Majors 3 Credit Hours
This course includes the study of exponents and radicals, graphs of equations, linear and quadratic equations, factoring, trigonometry functions and graphs, application of right and oblique triangles, fundamental identities, composite angle formulas, and inverse trigonometry functions. This course satisfies the General Studies requirement.
Prerequisite: Entrance Exam Placement or MATH 1314 **Offered: Fall/Yearly**

MATH 1342 Introductory Statistics 3 Credit Hours
This is a first course in statistics that requires knowledge of the fundamental procedures for data organization and analysis. Topics include frequency distributions, graphing, measures of central tendency, dispersion, positions, binomial distribution, normal curves, probability calculation, t-test, chi-square, F-test, hypothesis testing, and statistical estimation.
Prerequisite: MATH 1314 **Offered: Fall/Yearly**

MATH 1348 Geometry **3 Credit Hours**

The purpose of this course is to introduce the student to the fundamentals of plane and solid geometry. Desirable in its own right, this foundation is also essential for the study of higher mathematics and exceedingly helpful in everyday life. Topics are: axioms, angle measurement, proofs, constructions, perpendicular lines and planes, parallel lines and planes, ratio, proportion, similarity, area and volume.

Prerequisite: MATH 1314 **Offered: As Needed**

MATH 1350 Fundamental Concepts of Math for Elementary Education I **3 Credit Hours**

A mathematics course which covers the Texas Essential Knowledge and Skills (TEKS) objectives and the TExES objectives for grades EC-4. Emphasis will be placed on standards of the National Council of Teachers of Mathematics (NCTM). Topics include numeration systems, number systems, non-decimal number bases, algorithms, measurement, whole number algorithms, number theory, fractions, decimals and percents. These topics will be computer solutions to many problems using student designed programs and given programs; real vector spaces, subspaces, bases, dimensions of vector spaces, and spanning sets; eigenvalues, eigenvectors, and linear transformations.

Prerequisite: MATH 1314 **Offered: Fall As Needed**

MATH 1351 Fundamental Concepts of Mathematics for Elementary Education II **3 Credit Hours**

A mathematics course which covers TEKS objectives and the TExES objectives for grades K-4. Emphasis will be placed on standards of the NCTM. Topics include rational numbers, real numbers, functions, graphs, statistics, probability, geometric shapes, measurement, geometry using congruence and similarity, coordinate geometry, and geometry using transformations. Technology (multi-media carts) will be used throughout the course including computers and graphing calculators.

Prerequisite: Field Experience and MATH 1350 **Offered: Spring As Needed**

MATH 1360 Fundamental Concepts of Math for Secondary Schools **3 Credit Hours**

A survey of topics in secondary school mathematics, include geometry, linear programming, history of mathematics, graphing calculator, and computer applications in mathematics.

Prerequisite: MATH 1314 **Offered: As Needed**

MATH 2305 Discrete Mathematics **3 Credit Hours**

A required course for computer science majors. This course covers selected mathematical concepts that facilitate a deeper understanding of computer science and programming. It introduces number systems and computer arithmetic. Topics and concepts include sets, group codes, logic and truth table, Boolean algebra and its application to computer logic design, relations, and functions. Other topics covered include elementary matrix operations, permutations, combinations, and counting techniques.

Prerequisite: MATH 1314 **Offered: Spring/Yearly**

MATH 2312 Pre-Calculus **3 Credit Hours**
This course includes the study of coordinate geometry and models, functions and graphs, polynomial and rational functions, exponential and logarithmic functions, analytical geometry, and discrete mathematics. This course satisfies the General Studies requirement.
Prerequisite: Entrance Exam Placement or MATH 1316 **Offered: Spring/Yearly**

MATH 2318 Linear Algebra **3 Credit Hours**
This course covers matrices and their operations, special matrices including identities, symmetric and skew symmetric, idempotent, row operations on matrices in solving systems of equations, computer solutions to many problems using student designed and given programs, real vector spaces, subspaces, bases, dimensions of vector spaces, spanning sets, eigenvalues, eigenvectors, and linear transformations.
Prerequisite: MATH 1314 **Offered: Fall As Needed**

MATH 2320 Differential Equations **3 Credit Hours**
This course covers solutions of linear and nonlinear ordinary differential equations, and utilization of Laplace transform to solve ordinary differential equations.
Prerequisite: MATH 2414 **Offered: Spring As Needed**

MATH 2413 Calculus I **4 Credit Hours**
The standard first course in calculus. Topics include functions and their graphs, composition of functions, limits of functions, proofs, continuous functions, derivatives of algebraic functions, Newton's method, Rolle's Theorem, mean value theorem, local and extreme values of functions, application problems, related rates, concavity, higher order derivatives, and implicit differentiation.
Prerequisites: MATH 1314, 1316, 2312 or Entrance Exam Placement **Offered: Fall/Yearly**

MATH 2414 Calculus II **4 Credit Hours**
A second standard course in calculus. Topics include definite and indefinite integrals, using integrals to compute areas, volumes, growth, and decay, differentiation and integration of algebraic and transcendental functions, trigonometric substitutions, partial fractions, tables of integrals, and application.
Prerequisite: MATH 2413 **Offered: Spring/Yearly**

MATH 2415 Calculus III **4 Credit Hours**
A standard third course in calculus. Topics include infinite series, vector and analytical geometry, limits and continuity in three-space, gradients, tangent planes, partial and directional derivatives, polar coordinates, application of multiple integrals to area, volume, centroids, partial differentiation, and applications.
Prerequisite: MATH 2414 **Offered: Fall/Yearly**

MATH 2417 Advanced Calculus **3 Credit Hours**
Topics covered in this course include Vector-valued functions and their analysis, the geometry of Euclidean n-space, partial derivatives, functions of several variables, Taylor's theorem, infinite sequences and series, line and surface integral, LaGrange multipliers, multiple integrals, Green's and Stoke's theorems.
Prerequisite: MATH 2415 **Offered: As Needed**

MATH 3331 Modern Algebra **3 Credit Hours**
This course in abstract algebra utilizes the postulational approach. Topics considered include binary operations, mappings, number theory, rings, subrings, groups, subgroups, and fields.
Prerequisite: MATH 1314 **Offered: Fall As Needed**

MATH 3332 Complex Analysis **3 Credit Hours**
A first course in complex analysis covering complex numbers, analytic functions, contour integration, power series, analytic continuation, sequences of analytic functions, conformal mapping of simply connected regions, and related topics.
Prerequisite: MATH 2415 **Offered: Spring As Needed**

MATH 3333 Probability **3 Credit Hours**
A second course in statistics for students majoring in mathematics and sciences. The following topics are covered in this course: Discrete and continuous Probability functions, binomial, Poisson, normal, geometric, and gamma distribution, random variables, joint density, conditional densities, expected values, estimations, hypothesis testing, goodness-of-fit tests, and regression.
Prerequisite: MATH 1342 and MATH 2414 **Offered: Spring As Needed**

MATH 3334 General Topology **3 Credit hours**
Topics include introduction to sets, relations, openness, closedness, convergence, continuity, compactness, connectedness and fixed points in topological spaces with special emphasis on Euclidean spaces and metric spaces.
Prerequisite: MATH 1314 **Offered: As Needed**

MATH 3335 Numerical Analysis **3 Credit Hours**
This course covers polynomial forms and interpolation, divided differences, polynomial, uniform, least-squares and splines approximation; orthogonal polynomials; numerical differentiation; integration; splines; B-splines; and numerical methods for solving initial and boundary value problems for ordinary differential equations.
Prerequisites: MATH 2415, 2318 **Offered: Spring As Needed**

MATH 3336 Numerical Techniques for Computer Science Majors **3 Credit Hours**
This course emphasizes the use of computers in solving problems in applied mathematics. Topics include number presentation; errors in computer arithmetic, portability issues, error classification, well conditioned and ill-conditioned problems and iterative approximation to mathematical problems.
Prerequisites: MATH 2414 and 6 COSC Language Credits **Offered: Spring/Yearly**

MATH 3337 Real Analysis **3 Credit Hours**
Topics covered in this course include: real numbers, upper and bounds, intervals, mathematical induction, sequences and series, convergence, limits, continuity, derivatives, and integrals.
Prerequisite: MATH 2414 **Offered: Fall As Needed**

MATH 3338 Special Topics in Mathematics **3 Credit Hours**
This course will cover selected topics in mathematics of special interest to students or instructors. They may be a more in-depth treatment of survey courses or cover a specialty in mathematics. Possible topics include: Actuarial Science, Laplace Transforms, complex variables, calculus of variation, integral equations, and advanced differential equations.
Prerequisite: Instructor approval **Offered: Spring As Needed**

MATH 3398: Number Theory **3 Credit Hours**
Number theory is the study of properties of numbers in particular the integers and rational numbers. Questions in elementary number theory include divisibility properties of integers (e.g. the Euclidean algorithm), properties of primes (e.g. there are infinitely many), congruences, quadratic reciprocity and integer solutions to basic equations (e.g. Diophantine equations). Even though number theory is one of the oldest disciplines in mathematics, it has recently contributed too many practical problems such as coding theory, cryptography, hashing functions or other tools in modern information technology.
Prerequisite: MATH 1314 **Offered: As Needed**

MATH 4046 Mathematics Research/Project **0 Credit Hours**
The student plans and implements an independent mathematical study under the direction of faculty, using facilities available at Huston-Tillotson University or other sites if recommended by the mathematics faculty. Or the student may work with a mathematics faculty member in a specific research area. Course may be repeated with instructor approval.
Prerequisite: Instructor approval **Offered: Fall/Spring Yearly**

MATH 4146 Mathematics Research/Project **1 Credit Hour**
The student plans and implements an independent mathematical study under the direction of faculty, using facilities available at Huston-Tillotson University or other sites if recommended by the mathematics faculty. Or the student may work with a mathematics faculty member in a specific research area. Course may be repeated with instructor approval.
Prerequisite: Instructor approval **Offered: Fall/Spring Yearly**

MATH 4147 Mathematics Senior Seminar Fall/Spring **1/1 Credit Hour**
Senior seminar courses are taken by all Mathematics majors. The student attends one discussion hour per week and at least one science seminar participation hour per week. Oral discussion, a written report and presentation on selected topics developed from information gathered from professional journals and reference

books. In some cases laboratory investigations with written reports may be substituted. Specific requirements for the satisfactory completion of this course are outlined in the course syllabi for each semester.
Prerequisite: Senior Standing **Offered: Fall/Spring Yearly**

MATH 4246 Mathematics Research/Project **2 Credit Hours**
The student plans and implements an independent mathematical study under the direction of faculty, using facilities available at Huston-Tillotson University or other sites if recommended by the mathematics faculty. Or the student may work with a mathematics faculty member in a specific research area. Course may be repeated with instructor approval.
Prerequisite: Instructor approval **Offered: Fall/Spring Yearly**

MATH 4345 Mathematics Internship **3 Credit Hours**
This course is an internship experience for majors in Mathematics. Students work as interns in a mathematics-related industry.
Prerequisites: 12 Math Major Credits and Advisor Approval **Offered: Fall/Spring Yearly**

MATH 4346 Mathematics Research/Project **3 Credit Hours**
The student plans and implements an independent mathematical study under the direction of faculty, using facilities available at Huston-Tillotson University or other sites if recommended by the mathematics faculty. Or the student may work with a mathematics faculty member in a specific research area. Course may be repeated with instructor approval.
Prerequisite: Instructor approval **Offered: Fall/Spring Yearly**

MATH 4446 Mathematics Research/Project **4 Credit Hours**
The student plans and implements an independent mathematical study under the direction of faculty, using facilities available at Huston-Tillotson University or other sites if recommended by the mathematics faculty. Or the student may work with a mathematics faculty member in a specific research area. Course may be repeated with instructor approval.
Prerequisite: Instructor approval **Offered: Fall/Spring Yearly**