

# MATHEMATICS (MAT)

## MAT 083 Foundations for University Mathematics Credits: 3

**Typically Offered:** Fall, Spring.

**Course Description:** The study of fundamental arithmetic and algebraic concepts prerequisite to university level mathematics.

## MAT 110 Contemporary Problem Solving Credits: 3

**Typically Offered:** Fall, Spring.

**Course Description:** Mathematics for solving selected real-world problems using elementary graph theory, data analysis, techniques of decision making, and the mathematics of finance. Course content is equivalent to MAT 110E. **Prerequisite(s):** ACT math subscore of at least 22 or a sufficient score on the math placement exam or departmental approval.

**CORE 42:** MOTR MATH 120; Mathematical Reasoning and Modeling (attribute MO41)



## MAT 110E Contemporary Problem Solving Credits: 4

**Typically Offered:** Fall, Spring.

**Course Description:** Mathematics for solving selected real-world problems using elementary graph theory, data analysis, techniques of decision making, and the mathematics of finance. Course content is equivalent to MAT 110. Three hours lecture, two hours lab.

**CORE 42:** MOTR MATH 120; Mathematical Reasoning and Modeling (attribute MO41)



## MAT 111 Introductory Statistics Credits: 3

**Typically Offered:** Fall, Spring.

**Course Description:** A general introduction to statistics for students whose academic interests involve the analysis and interpretation of data. Emphasis is placed on the development of statistical thinking and the use of technology. Topics include graphical and numerical methods for summarizing univariate and bivariate data, basic probability, discrete and continuous probability distributions, linear regression, characteristics of good study designs, confidence intervals and hypothesis testing. Course content is equivalent to MAT 111E. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.

**CORE 42:** MOTR MATH 110; Statistical Reasoning (attribute MO41)



## MAT 111E Introductory Statistics Credits: 4

**Typically Offered:** Fall, Spring.

**Course Description:** A general introduction to statistics for students whose academic interests involve the analysis and interpretation of data. Emphasis is placed on the development of statistical thinking and the use of technology. Topics include graphical and numerical methods for summarizing univariate and bivariate data, basic probability, discrete and continuous probability distributions, linear regression, characteristics of good study designs, confidence intervals and hypothesis testing. Course content is equivalent to MAT 111. Three hours lecture, two hours lab.

**CORE 42:** MOTR MATH 110; Statistical Reasoning (attribute MO41)



## MAT 112 Finite Mathematics Credits: 3

**Typically Offered:** Fall, Spring.

**Course Description:** Linear and quadratic equations, graphs, and functions including exponential and logarithmic functions; mathematics of finance, annuities, sinking funds and mortgages; linear programming; counting methods, probability, expectation; descriptive statistics. Not open to the student with credit in MAT 167. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.

**CORE 42:** MOTR MATH 120; Mathematical Reasoning and Modeling (attribute MO41)



## MAT 116 College Algebra Credits: 3

**Typically Offered:** Fall, Spring.

**Course Description:** Linear, quadratic, and miscellaneous equations and inequalities; relations and functions including polynomial, exponential, and logarithmic functions; graphing; systems of equations; and matrices. Not open to the student with credit in MAT 167. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.

**CORE 42:** MOTR MATH 130; Pre-Calculus Algebra (attribute MO41)



## MAT 119 Trigonometry Credits: 2

**Typically Offered:** Fall, Spring.

**Course Description:** Trigonometric functions, trigonometric identities, trigonometric equations, solution of triangles, inverse trigonometric functions. Not open to the student with credit in MAT 167. **Prerequisite(s):** ACT math subscore of at least 22; a sufficient score on the math placement exam; a minimum grade of C in MAT 110 or MAT 110E or higher; departmental approval.

## MAT 147 Applied Calculus Credits: 5

**Typically Offered:** Fall.

**Course Description:** An applied course in techniques of differentiation and integration; applications primarily from the technological fields; analytic geometry, functions, differential and integral calculus. **Prerequisite(s):** ACT math score of 25 or higher or a grade of C or higher in MAT 116.

**CORE 42:** MOTR MATH OTHER; Mathematical Sciences (attribute MO41)



## MAT 167 Calculus with Analytic Geometry I Credits: 5

**Typically Offered:** Fall.

**Course Description:** The first of three sequenced courses in calculus. Includes the study of limits and continuity of real functions, the derivative and its applications, the integral, and the integration and differentiation of trigonometric, exponential and logarithmic functions. **Prerequisite(s):** ACT math score of 25 or higher or a grade of C or higher in MAT 116 and MAT 119.

**CORE 42:** MOTR MATH OTHER; Mathematical Sciences (attribute MO41)



**MAT 177 Calculus with Analytic Geometry II Credits: 3****Typically Offered:** Spring (odd-numbered years).**Course Description:** The second of three sequenced courses in calculus. Includes the study of applications of integration, integration techniques, improper integrals, differential equations, and infinite sequences and series. **Prerequisite(s):** A grade of C or higher in MAT 147 or MAT 167.**MAT 206 Mathematical Transitions Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** This course is designed to prepare students thoroughly for the transition into university level mathematics. Its main content is the development of formal proof, concise logical reasoning and the ability to write mathematically. Topics include but not limited to proof techniques, induction, number systems, function and sets, complex numbers, series and sequences, matrices. **Prerequisite(s):** Credit or concurrent enrollment in MAT 177.**MAT 211 Applied Statistical Reasoning Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Fundamental principles and techniques of statistical investigations and data analysis. Going beyond the typical introductory statistics course, this course focuses on the methods of analysis of variance and linear regression. Students are introduced to the R programming language for exploring data sets and performing statistical tests. **Prerequisite(s):** Credit or concurrent enrollment in MAT 147 or MAT 167.**MAT 217 Modeling and Simulation Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Fundamental principles and techniques of modeling and simulation. Iterative and recursive algorithms will be used to explore mathematical problem-solving techniques such as factoring and simplifying expressions, solving equations, differentiation and integration, and plotting curves and surfaces. **Prerequisite(s):** Credit or concurrent enrollment in MAT 147 or MAT 167.**MAT 283 Introduction to Research Methods in Mathematics Credits: 1-2****Typically Offered:** Departmental Discretion.**Course Description:** Introduction to basic research methods in Mathematics. Individual and team projects involving methods for solving mathematics-related research problems. **Prerequisite(s):** Departmental approval.**MAT 287 Multivariable Calculus Credits: 3****Typically Offered:** Spring (even-numbered years).**Course Description:** The third of three sequenced courses in calculus. Includes the study of solid analytic geometry, vectors and vector calculus, partial differentiation, and multiple integrals. **Prerequisite(s):** A grade of C or higher in MAT 147 or MAT 167.**MAT 305 Applied Matrix Theory Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** The study of systems of equations, matrices, linear transformations, matrix operations, determinants, matrix inversion, linear systems, eigenvalues and eigenvectors, with an emphasis on concrete computations and applications. **Prerequisite(s):** A grade of C or higher in MAT 217.**MAT 306 Linear Algebra Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Vector spaces, linear transformations, matrix operations, determinants, matrix inversion, linear systems, eigenvalues, canonical forms. **Prerequisite(s):** Credit or concurrent enrollment in MAT 287.**MAT 309 Data Visualization Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** An introduction to the basic principles of effective data visualization. Students gain hands-on experience with tools and techniques used for accessing, exploring, and summarizing large data sets. Students learn to create graphics and data dashboards to effectively convey and communicate their observations and insights. **Prerequisite(s):** A grade of C or higher in MAT 211.**MAT 315 Topics in Geometry Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Synthetic projective geometry; basic symbolic logic; mathematical systems and finite geometries; algebraic geometry; non-Euclidean geometry. **Prerequisite(s):** Credit or concurrent enrollment in MAT 306.**MAT 317 Differential Equations Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Common types of ordinary differential equations; differential operators, Laplace transforms; systems of differential equations; partial differential equations; Fourier series; applications. **Prerequisite(s):** A grade of C or higher in both MAT 287 and MAT 305.**MAT 332 Probability Theory Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** The study of discrete and continuous probability distributions. **Prerequisite(s):** A grade of C or higher in MAT 177 or MAT 287.**MAT 352 Mathematics for Elementary and Middle School Teachers I Credits: 3****Typically Offered:** Fall, Spring.**Course Description:** The development of a teacher's understanding of elementary school mathematics, including the study of whole number arithmetic, mental mathematics, pre-algebra, problem solving, number theory, and operations on fractions, integers, decimals, and irrational numbers. Not applicable to the major or minor in mathematics. **Prerequisite(s):** A grade of C or higher in MAT 112 or MAT 116.**MAT 353 Mathematics for Elementary and Middle School Teachers II Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** Introductory geometry; geometric constructions; measurement geometry; motion geometry; introductory probability and statistics. Not applicable to the major or minor in mathematics. **Prerequisite(s):** A grade of C or higher in MAT 352.**MAT 401 Advanced Modeling Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** A study of the modeling process including creative and empirical model construction, model analysis, and model research. **Prerequisite(s):** A grade of C or higher in MAT 317.**MAT 409 Statistical Learning Credits: 3****Typically Offered:** Departmental Discretion.**Course Description:** This course will provide a broad introduction to machine learning and cover the fundamental algorithms for supervised and unsupervised learning, with a focus on regression and classification methods. Emphasis will be on statistical learning methodology and the models, intuition, and assumptions behind it, as well as applications to real-world problems. Algorithms are implemented using the R programming language. **Prerequisite(s):** A grade of C or higher in MAT 211 and MAT 305.

**MAT 411 Bayesian Data Analysis Credits: 3**

**Typically Offered:** Departmental Discretion.

**Course Description:** An applied approach to Bayesian Data Analytics. This course starts with an introduction to Bayes rules and then uses concepts in calculus to develop Markov Chain Monte Carlo methods. Topics include, but are not limited to, Bayesian multiple linear regression, logistic regression, binomial models, and hierarchical models. **Prerequisite(s):** A grade of C or higher in MAT 217 or a grade of C or higher in CSC 184 and MAT 167.

**MAT 416 Abstract Algebra Credits: 3**

**Typically Offered:** Departmental Discretion.

**Course Description:** Groups, rings, and fields; definitions and fundamental theorems; homomorphisms and isomorphisms; polynomials and field extensions. **Prerequisite(s):** A grade of C or higher in MAT 206 and MAT 306.

**MAT 450 Independent Research/Project Credits: 1-3**

**Typically Offered:** Departmental Discretion.

**Course Description:** Investigation of a research problem, project, or topic on an individual conference basis. May be repeated for credit.

**Prerequisite(s):** Minimum of 2.5 GPA in major field, a grade of C or higher in MAT 287, and departmental approval.

**MAT 462 Number Theory Credits: 3**

**Typically Offered:** Departmental Discretion.

**Course Description:** Study of divisibility, primes, congruencies, diophantine equations, arithmetic functions, partitions, Fibonacci numbers, and continued fractions. An independent method of study will be used.

**Prerequisite(s):** A grade of C or higher in MAT 206.

**MAT 465 Mathematics Teaching: Methods and Materials Credits: 3**

**Typically Offered:** Departmental Discretion.

**Course Description:** Techniques, materials, and resources used in the mathematics curriculum in secondary schools. Not appropriate for the major in mathematics without teacher certification. **Prerequisite(s):** A grade of C or higher in EDU 203 and credit or concurrent enrollment in MAT 206.

**MAT 470 Seminar in Mathematics Credits: 3**

**Typically Offered:** Departmental Discretion.

**Course Description:** Selected topics in mathematics. May be repeated for credit. **Prerequisite(s):** Departmental approval.