

# MATHEMATICS

Pamela Woodbury, Division Chair  
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Prefix	Course
MAT	Mathematics

## Adamson, Scott

- A.A., Itasca Community College
- B.S., M.Ed., Northern Arizona University
- PH.D., Arizona State University

## Beaumont, Jonah

- M.S., Northern Arizona University

## Bishop, Shannon

- B.A., M.A., Arizona State University
- PH.D., Sam Houston State University

## Cox, Frank (Trey)

- B.A., M.S., Concordia University Wisconsin
- PH.D., Arizona State University

## Evangelista, Arlene

- B.S., M.N.S., Arizona State University

## Flores, Alfinio

- PH.D., University of Ohio

## Groseta, Alexandra (Sasha)

- M.A., Arizona State University

## Jeanson, Andrew

- B.S., Elmhurst College
- M.A., University of Arizona

## Joyner, Kacie

- B.B.A., Texas Christian University
- M.N.S., Arizona State University

## Judson-Garcia, Julia G.

- M.A., Arizona State University

## Llamas-Flores, Silvia

- B.S., M.A., University of California
- Los Angeles; PH.D., Arizona State University

## Pardo, Roberta

- B.S., M.Ed., Northern Arizona University
- PH.D., Sam Houston State University

## Podmanik, Milos

- B.A., Arizona State University
- M.S., Northern Arizona University

## Ramirez, Jason

- B.A., B.S., M.Ed., Northern Arizona University

## Reynolds-Garza, Anne

- B.A., Eastern Illinois University
- M.A., M.Ed., Framingham State University

## Steele, Arezoo (Sue)

- B.S., University of Melbourne, Australia
- M.S., Arizona State University

## Strom, April

- B.A., M.A., Texas Tech University
- PH.D., Arizona State University

## Woodbury, Pamela

*Division Chair*

- B.S., University of Miami
- M.S., Lehigh University

## Mathematics (MAT)

### MAT051 / Number Sense I

#### 1 Credit / 1.0 Periods for Lecture

Primary emphasis on conceptual understanding of whole numbers, integers and mathematical operations. Use systems of measure and Pythagorean Theorem. Focus on mathematical language, connections, patterns and reasoning. Prerequisites: None.

**Division:** Mathematics

### MAT052 / Number Sense II

#### 1 Credit / 1.0 Periods for Lecture

Primary emphasis on conceptual understanding of decimals and fractions, and decimal and fraction addition and subtraction. Solving problems involving decimals and fractions. Focus on mathematical language, connections, patterns and reasoning. Prerequisites: A grade of C or better in MAT051, or an appropriate district placement.

**Division:** Mathematics

### MAT053 / Multiplicative and Proportional Reasoning

#### 1 Credit / 1.0 Periods for Lecture

Primary emphasis on conceptual understanding of decimals and fractions, and decimal and fraction multiplication and division. Solving problems involving decimals, fractions, and percentages. Focus on additive and multiplicative reasoning including proportionality and similarity. Prerequisites: A grade of C or better in each of the following courses: (MAT051 and MAT052), or an appropriate district placement.

**Division:** Mathematics

### MAT054 / Geometry

#### 1 Credit / 1.0 Periods for Lecture

Primary emphasis on conceptual understanding of and solving problems involving angles and geometric figures. Use of systems of measure, similarity, proportionality and the Pythagorean theorem. Prerequisites: A grade of "C" or better, or satisfactory Math Diagnostic Assessment Score for MAT051, MAT052 and MAT053. Corequisites: MAT055, or MAT056, or MAT057.

**Division:** Mathematics

**MAT055 / Algebraic Structures****1 Credit / 1.0 Periods for Lecture**

Emphasis on meanings related to variable, equality, inequality, equivalence. The use of additive and multiplicative reasoning in solving linear equations and inequalities in one variable. Validation of solution(s) through a reasonable mathematical defense. Transfer and apply knowledge through a process of sense making and reasonableness in mathematical problems and practical application situations.

Prerequisites: A grade of C or better in each of the following courses: (MAT051, MAT052, and MAT053), or a grade of C or better for MAT08+, or an appropriate district placement.

**Division:** Mathematics

**MAT056 / Functions I****1 Credit / 1.0 Periods for Lecture**

Recognize patterns and organize data to represent situations where output is related to input. Understand the concept of function and be able to represent functions in multiple ways, including tables, algebraic rules, graphs and contextual situations, and make connections among these representations. Prerequisites: A grade of C or better in each of the following courses: (MAT051, MAT052, MAT053, and MAT055), OR a grade of C or better in (MAT055 and MAT08+), OR an appropriate district placement.

**Division:** Mathematics

**MAT057 / Functions II****1 Credit / 1.0 Periods for Lecture**

Read, represent, and interpret linear function relationships numerically, analytically, graphically and verbally and connect the different representations. Model and solve real world problems involving constant rate of change. Prerequisites: A grade of C or better in each of the following courses: (MAT051, MAT052, MAT053, MAT055, and MAT056), OR a grade of C or better in (MAT055, MAT056, and MAT08+), OR an appropriate district placement.

**Division:** Mathematics

**MAT112 / Mathematical Concepts and Applications****3 Credits / 3.0 Periods for Lecture**

A problem solving approach to mathematics as it applies to real-life situations. Development, use and communication of mathematical concepts and applications that relate to measurement, percentage, practical geometry, statistics, finance, and unit conversions.

Prerequisites: None.

**Division:** Mathematics

**MAT121 / Intermediate Algebra****4 Credits / 4.0 Periods for Lecture**

Analysis of rational, radical, quadratic and exponential equations, functions and applications; graphs of radical, quadratic and exponential functions; operations on polynomial, rational, and radical expressions.

Prerequisites: A grade of C or better in each of the following courses: (MAT055, MAT056, and MAT057), OR a grade of C or better in MAT09+, OR an appropriate district placement. Course Notes: Students may receive credit for only one of the following: MAT120, OR MAT121, OR MAT122 OR MAT126.

**Division:** Mathematics

**MAT141 / College Mathematics****4 Credits / 4.0 Periods for Lecture**

Working knowledge of college-level mathematics and its applications to real-life problems. Emphasis on understanding mathematical concepts and their applications. Topics include proportional reasoning, modeling, finance, probability, and statistics. Prerequisites: An appropriate District placement, or a grade of C or better in (MAT052, MAT053, and MAT055), or (MAT055, MAT056, and MAT057), or MAT085, or MAT09+, or MAT103, or MAT114, or MAT115, or MAT12+. Course Notes: MAT141 students may receive credit for only one of the following: MAT140, MAT141, MAT142, MAT145, or MAT146.



SUN# MAT 1142

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics



**MAT142 / College Mathematics****3 Credits / 3.0 Periods for Lecture**

Working knowledge of college-level mathematics and its applications to real-life problems. Emphasis on understanding mathematical concepts and their applications. Topics include proportional reasoning, modeling, finance, probability, and statistics. Prerequisites: An appropriate District placement, or a grade of C or better in (MAT052, MAT053, and MAT055), or (MAT055, MAT056, and MAT057), or MAT085, or MAT09+, or MAT103, or MAT114, or MAT115, or MAT12+. Course Notes: MAT142 students may receive credit for only one of the following: MAT140, MAT141, MAT142, MAT145, or MAT146.



SUN# MAT 1142

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics

**MAT151 / College Algebra/Functions****4 Credits / 4.0 Periods for Lecture**

Analysis and interpretation of the behavior and nature of functions including linear, quadratic, higher-order polynomials, rational, exponential, logarithmic, power, absolute value, and piecewise-defined functions; systems of equations, using multiple methods including matrices, and modeling and solving real world problems. Prerequisites: A grade of C or better in MAT095, or MAT096, or MAT114, or MAT115, or MAT12+, OR an appropriate district placement for MAT15+ OR permission of Department or Division Chair. Course Notes: Students may receive credit for only one of the following: MAT150, OR MAT151, OR MAT152, OR MAT155, OR MAT156.

**Division:** Mathematics

**MAT152 / College Algebra/Functions****3 Credits / 3.0 Periods for Lecture**

Analysis and interpretation of the behavior and nature of functions including linear, quadratic, higher-order polynomials, rational, exponential, logarithmic, power, absolute value, and piecewise-defined functions; systems of equations, using multiple methods including matrices, and modeling and solving real world problems. Prerequisites: A grade of C or better in MAT095, or MAT096, or MAT114, or MAT115, or MAT12+, OR an appropriate district placement for MAT15+, OR permission of Department or Division Chair. Course Notes: Students may receive credit for only one of the following: MAT150, OR MAT151, OR MAT152, OR MAT155, OR MAT156.

**Division:** Mathematics

**MAT187 / Precalculus****5 Credits / 5.0 Periods for Lecture**

Topics in algebra and trigonometry in preparation for calculus.

Prerequisites: A grade of C or better in MAT15+, or an appropriate district placement. Course Notes: Students may receive credit for only one of the following: MAT182 OR MAT187.

**Division:** Mathematics

**MAT212 / Brief Calculus****3 Credits / 3.0 Periods for Lecture**

Introduction to the theory, techniques and applications of the differential and integral calculus of functions with problems related to business, life, and the social sciences. Prerequisites: A grade of C or better in MAT15+, or MAT187, or an appropriate District placement. Course Notes: Students may receive credit for only one of the following: MAT212 or MAT213.



SUN# MAT 2212

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics



**MAT213 / Brief Calculus****4 Credits / 4.0 Periods for Lecture**

Introduction to the theory, techniques, and applications of the differential and integral calculus of functions with problems related to business, life, and the social sciences. Prerequisites: A grade of C or better in MAT15+, or MAT187, or an appropriate District placement. Course Notes: Students may receive credit for only one of the following: MAT212 or MAT213.



SUN# MAT 2212

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics

**MAT217 / Mathematical Analysis for Business****3 Credits / 3.0 Periods for Lecture**

An introduction to the mathematics required for the study of business. Includes multivariable optimization, Lagrange multipliers, linear programming, linear algebra, probability, random variables, discrete and continuous distributions. Prerequisites: A grade of C or better in MAT212, or MAT213, or MAT220, or MAT221. Course Notes: Students may receive credit for only one of the following: MAT217 or MAT218.

**Division:** Mathematics

**MAT220 / Calculus with Analytic Geometry I****5 Credits / 5.0 Periods for Lecture**

Limits, continuity, differential and integral calculus of functions of one variable. Prerequisites: A grade of C or better in MAT187, or MAT188, or an appropriate District placement. Course Notes: MAT220 students may receive credit for only one of the following: MAT220 or MAT221.

**Division:** Mathematics

**MAT221 / Calculus with Analytic Geometry I****4 Credits / 4.0 Periods for Lecture**

Limits, continuity, differential and integral calculus of functions of one variable. Prerequisites: A grade of C or better in MAT187, or MAT188, or an appropriate District placement. Course Notes: Student may receive credit for only one of the following: MAT220 or MAT221.

**Division:** Mathematics

**MAT225 / Elementary Linear Algebra****3 Credits / 3.0 Periods for Lecture**

Introduction to matrices, systems of linear equations, determinants, vector spaces, linear transformations and eigenvalues. Emphasizes the development of computational skills. Prerequisites: A grade of C or better in MAT212 or MAT213 or MAT220 or MAT221, or equivalent.

**Division:** Mathematics

**MAT227 / Discrete Mathematical Structures****3 Credits / 3.0 Periods for Lecture**

Course emphasizes discrete mathematics connections to computer science by exposing students to foundational concepts of set theory, logic, counting, induction, proof techniques, graph theory, and algorithms. Prerequisites: A grade of C or better in MAT212, or MAT213, or MAT220, or MAT221, or permission of Department or Division Chair.



SUN# MAT 2227

**Division:** Mathematics

**MAT230 / Calculus with Analytic Geometry II****5 Credits / 5.0 Periods for Lecture**

Techniques of integration for both proper and improper integrals with applications to the physical and social sciences, elements of analytic geometry, and the analysis of sequences and series. Prerequisites: A grade of C or better in MAT220, or MAT221, or equivalent. Course Notes: Student may receive credit for only one of the following: MAT230 or MAT231.

**Division:** Mathematics

**MAT231 / Calculus with Analytic Geometry II****4 Credits / 4.0 Periods for Lecture**

Techniques of integration for both proper and improper integrals with applications to the physical and social sciences, elements of analytic geometry, and the analysis of sequences and series. Prerequisites: A grade of C or better in MAT220, or MAT221, or equivalent. Course Notes: Student may receive credit for only one of the following: MAT230 or MAT231.

**Division:** Mathematics

**MAT240 / Calculus with Analytic Geometry III****5 Credits / 5.0 Periods for Lecture**

Multivariate calculus including vectors, vector-valued functions, partial differentiation, multiple integration, and an introduction to vector fields.

Prerequisites: Grade of "C" or better in MAT230 or MAT231. Course Notes: Student may receive credit for only one of the following: MAT240 or MAT241.

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics

**MAT241 / Calculus with Analytic Geometry III****4 Credits / 4.0 Periods for Lecture**

Multivariate calculus including vectors, vector-valued functions, partial differentiation, multiple integration and an introduction to vector fields.

Prerequisites: Grade of "C" or better in MAT230 or MAT231. Course Notes: Student may receive credit for only one of the following: MAT240 or MAT241.



SUN# MAT 2241

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics

**MAT256 / Investigating Quantity: Number, Operations and Numeration Systems****4 Credits / 4.0 Periods for Lecture**

Explore number, numeration systems and operations on numbers.

Techniques of problem solving with an emphasis on exploring a variety of strategies. Use a variety of visualization techniques to develop a conceptual understanding of these topics. Prerequisites: A grade of C or better in (MAT15+ or higher), or (MAT12+ and MAT14+), or [MAT14+ and (MAT114 or MAT115)], or (MAT14+ and an appropriate District placement into MAT150, MAT151, or MAT152), or permission of Department/Division Chair. Course Notes: MAT256 is designed to meet requirements for prospective elementary education teachers.

**Division:** Mathematics

**MAT257 / Investigating Geometry, Probability and Statistics****4 Credits / 4.0 Periods for Lecture**

Explores geometry, measurement, probability and statistics. Uses visualization, technologies, problem solving, reasoning and proof to develop a conceptual understanding of these topics. Prerequisites: A grade of C or better in MAT256 or permission of Department/Division Chair. Course Notes: MAT257 is designed to meet the requirements for prospective elementary education teachers.

**Division:** Mathematics

**MAT276 / Modern Differential Equations****4 Credits / 4.0 Periods for Lecture**

Introduces differential equations, theoretical and practical solution techniques with applications. Problem-solving using MATLAB.

Prerequisites: A grade of C or better in MAT230 or MAT231 or permission of Department/Division Chair.

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics

**MAT277 / Modern Differential Equations****3 Credits / 3.0 Periods for Lecture**

Introduces differential equations, theoretical and practical solution techniques with applications. Problem-solving using MATLAB.

Prerequisites: A grade of C or better in MAT230 or MAT231 or permission of Department/Division Chair. Course Notes: Students may receive credit for only one of the following: MAT276 or MAT277.

**Fulfills:** Mathematics [MA]; Mathematics [MA]-in combo

**Division:** Mathematics

**MAT280 / Foundational Statistics for Engineers****3 Credits / 5.0 Periods for Lecture & Lab**

Fundamentals of probability, descriptive statistics, sampling distributions, parameter estimation, tests of hypotheses, regression analysis, analysis of variance, and design of experiments. Prerequisites: A grade of C or better in MAT220, or MAT221, or equivalent.

**Crosslisted:** ECE280

**Division:** Mathematics

**MAT282AA / Service-Learning Experience in Mathematics****1 Credit / 1.0 Periods for Laboratory**

Unpaid Service-Learning (SL) experience, completed with approved community partner. Prerequisites: Permission of Instructor. Course Notes: MAT282AA may be repeated for a total of six (6) credit hours.

Standard grading is available according to procedures outlined in catalog.

**Division:** Mathematics