

Program Cover Document - MAT 119: Introduction to Functions

I. Basic Course Information

MAT 119: Introduction to Functions is a course worth one course unit that has two 80-minute meeting times each week. The purpose of the course is to prepare students for success in MAT 125: *Calculus for Business and Social Sciences*.

Course Description (for Bulletin): Introduction to Functions teaches students the foundational skills needed for success in a Business Calculus course. The course topics include: the fundamentals of algebra, functions, exponential functions, logarithms, and financial models. Stress is on computational and problem-solving techniques.

II. Learning Goals

Students should acquire the ability to:

- a. Demonstrate basic properties of real numbers.
- b. Perform fundamental operations on algebraic and transcendental functions and simplify the results.
- c. Determine the domain and range of these functions, including composite functions.
- d. Sketch graphs of these functions by an analysis of their properties rather than by merely plotting sets of points.
- e. Find the zeros of functions and solve algebraic equations.
- f. Solve problems using logarithmic and exponential functions.
- g. Solve "verbal" problems relating to applications.

The course will cover the following concepts. The specific list of topics and sections to be covered is appended to this document.

- a. Review of sets, intervals, Cartesian coordinates, graphs.
- b. Functions: range, domain, inverse functions.
- c. Analytic Geometry: slopes of lines, distance formula, linear equations, translation of coordinates, equations of all conics with translations, symmetry, odd and even functions.
- d. Algebra: polynomials, roots of polynomials of low degree, graphs of polynomial functions, basic rational functions

- e. Logarithmic and exponential equations, graphs, logarithmic techniques for solving equations, exponential growth/decay and interest problems.

III. Learning Activities

Learning activities may consist of a combination of lectures and group work. The specific choice will depend on the individual instructor. Outside of class, students are expected to do a significant amount of individual and group homework to achieve the learning goals.

- a. An attempt will be made to use problems that motivate the theoretical aspects of the course.
- b. Introduction and formal presentation of basic concepts by the instructor and/or capable students.
- c. Outside projects to meet the needs and/or interests of individuals or groups will be pursued and presented to the class if merited.
- d. The course meets TCNJ's standard of a "fourth hour" through a) the assignment of a significant amount of out-of-class work expected; and b) the scheduling of a fourth recitation hour for students who need tutoring.

IV. Student Assessment

- a. Students will be assessed by their class participation, homework, quizzes, and written examinations.
- b. Instructors will provide regular feedback to students through homework, quizzes, and tests to enable students to improve their understanding.
- c. There will be a common set of homework assignments and a common final for all sections of the course. Instructors are welcome to assign additional homework assignments.

V. Course Evaluation

The course will be assessed for its effectiveness in the following ways:

- a. Students
 - a. Student evaluations.
 - b. Student performance in MAT 125: *Calculus for Business and Social Sciences*.
 - c. Student performance on final
- b. Colleagues
 - a. Departmental and Calculus committee discussions
 - b. Consultation with other departments the course serves

VI. Bibliography

- a. J. Stewart, L. Redlin, S. Watson, *College Algebra (7th Edition)*, Cengage Learning.

Topics List for MAT 119: Introduction to Functions

Chapters 1-4 are required. Chapters 5, 6, 8 are time permitting.

Chapter 1: Equations and Graphs (Minimal time should be spent on this chapter)

- 1.1: The Coordinate Plane
- 1.2: Graphs of Equations in Two Variables; Circles
- 1.3: Lines
- 1.4: Solving Quadratic Equations
- 1.5: Complex Numbers
- 1.6: Solving Other Types of Equations
- 1.7: Solving Inequalities
- 1.8: Solving Absolute Value Equations and Inequalities
- 1.9: Solving Equations and Inequalities Graphically

Chapter 2: Functions

- 2.1: Functions
- 2.2: Graphs of Functions
- 2.3: Getting Information from the Graph of a Function
- 2.4: Average Rate of Change of a Functions
- 2.5: Linear Functions and Models
- 2.6: Transformations of Functions
- 2.7: Combining Functions
- 2.8: One-to-one Functions and Their Inverses

Chapter 3: Polynomial and Rational Functions

- 3.1: Quadratic Functions and Models
- 3.2: Polynomials Functions and Their Graphs
- 3.3: Dividing Polynomials -- Long Division of Polynomials, Remainder and Factor Theorem. Synthetic Division is an optional topic.
- 3.6: Rational Functions

Chapter 4: Exponential and Logarithmic Functions (This chapter should be emphasized)

- 4.1: Exponential Functions
- 4.2: The Natural Exponential Function
- 4.3: Logarithmic Functions
- 4.4: Laws of Logarithms
- 4.5: Exponential and Logarithmic Functions
- 4.6: Modeling with Exponential Functions

Chapter 5: Systems of Equations and Inequalities

- 5.1: Systems of Linear Equations in Two Variables
- 5.2: Systems of Linear Equations in Several Variables
- 5.4: Systems of Nonlinear Equations

Chapter 6: Matrices and Determinants

- 6.1: Matrices and Systems of Linear Equations
- 6.2: The Algebra of Matrices
- 6.3: Inverses of Matrices and Matrix Equations
- 6.4: Determinants and Cramer's Rule

Chapter 8: Sequences and Series

- 8.1: Sequences and Summation Notation
- 8.2: Arithmetic Sequences
- 8.3: Geometric Sequences
- 8.4: Mathematics of Finance