**The College of New Jersey  
Mathematics and Statistics Department**

**Program Cover Document - MAT 120: Precalculus**

**I. Basic Course Information**

MAT 120: Precalculus is a one course unit course that has two 80-minute meeting times each week. The purpose of the course is to prepare students for success for a subsequent Calculus course.

*Course Prerequisite*: MAT 095: Intermediate Algebra.

*Course Description (for Bulletin)*: The Precalculus course teaches students the foundational skills needed for success in a Calculus course. The course topics include: the fundamentals of algebra, exponential functions, logarithms, and trigonometry. Stress is on computational and problem-solving techniques.  
  
**II. Learning Goals**

Students should acquire the ability to:

1. Demonstrate basic properties of real numbers.
2. Perform fundamental operations on algebraic and transcendental functions and simplify the results.
3. Determine the domain and range of these functions, including composite functions.
4. Sketch graphs of these functions by an analysis of their properties rather than by merely plotting sets of points.
5. Find the zeros of functions and solve algebraic and trigonometric equations.
6. Solve problems using logarithmic and exponential functions.
7. Solve problems using trigonometric functions.
8. 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.

1. Review of sets, intervals, Cartesian coordinates, graphs.
2. Functions: range, domain, inverse functions.
3. Analytic Geometry: slopes of lines, distance formula, linear equations, translation of coordinates, equations of all conics with translations, symmetry, odd and even functions.
4. Algebra: polynomials, roots of polynomials of low degree, graphs of polynomial functions, basic rational functions
5. Trigonometry: Angular measure, basic trigonometric functions and their graphs, basic trigonometric identities and equations
6. 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.

1. An attempt will be made to use problems that motivate the theoretical aspects of the course.
2. Introduction and formal presentation of basic concepts by the instructor and/or capable students.
3. Outside projects to meet the needs and/or interests of individuals or groups will be pursued and presented to the class if merited.
4. 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**

1. Students will be assessed by their class participation, homework, quizzes, and written examinations.
2. Instructors will provide regular feedback to students through homework, quizzes, and tests to enable students to improve their understanding.
3. 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:

1. Students
   1. Student evaluations.
   2. Student performance in the following Calculus course.
   3. Student performance on the common final
2. Colleagues
   1. Departmental and Calculus committee discussions
   2. Consultation with other departments the course serves

**VI. Bibliography**

* 1. J. Stewart, L. Redlin, S. Watson, *Precalculus: Mathematics for Calculus (7th Edition),* Cengage Learning.

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**Precalculus Topics List**

1. Chapter 1
   1. 1.4: Rational Expressions
   2. 1.5: Equations
   3. 1.7 Modeling with Equations
   4. 1.8: Inequalities
   5. 1.9: Graphs of Equations
   6. 1.10: Lines
   7. 1.11: Solving Equations and Inequalities Graphically
2. Chapter 2
   1. 2.1: Functions
   2. 2.2: Graphs of Functions
   3. 2.3: Getting Values from the Graph of a Function
   4. 2.6: Transformations of Functions
   5. 2.7: Combining Functions
   6. 2.8: Inverse Functions (Should be emphasized)
3. Chapter 3
   1. 3.1: Quadratic Functions and Models
   2. 3.2: Polynomials Functions and Their Graphs
   3. 3.3: Dividing Polynomials
      1. Long Division of Polynomials, Remainder and Factor Theorem. Synthetic Division is an optional topic.
   4. 3.6: Rational Functions
4. Chapter 4 (This chapter should be emphasized)
   1. 4.1: Exponential Functions
   2. 4.2: The Natural Exponential Function
   3. 4.3: Logarithmic Functions
   4. 4.4: Laws of Logarithms
   5. 4.5: Exponential and Logarithmic Equations
   6. 4.6: Modeling with Exponential Functions
5. Chapter 5
   1. 5.1: Unit Circle
   2. 5.2: Trigonometric Functions of Real Numbers
   3. 5.3: Trigonometric Graphs
   4. 5.4: More Trigonometric Graphs
   5. 5.5: Inverse Trigonometric Functions
6. Chapter 6
   1. 6.1: Angle Measures
   2. 6.2: Trigonometric Functions for Right Triangles
   3. 6.3: Trigonometric Functions of Angles
   4. 6.4: Inverse Trigonometric Functions and Right Triangles
7. Chapter 7
   1. 7.1: Trigonometric Identities
   2. 7.2: Addition/Subtraction Identities
   3. 7.3: Double/Half-Angle Formulas
   4. 7.4: Basic Trigonometric Equations