

NASSAU COMMUNITY COLLEGE  
DEPARTMENT OF MATHEMATICS/STATISTICS/COMPUTER PROCESSING  
Course Outline for

**MAT 111**  
**Pre-Calculus**

Curriculum	Interdisciplinary
Lab hours	None
Semesters offered	Indicated in Catalog
Length of semester	15 Weeks
Class hours	4.5
Credits	4
Text	Functions Modeling Change: A Preparation for Calculus 4 <sup>th</sup> Ed. by Connally, et. al., published by Wiley; or Precalculus: Enhanced with Graphing Utilities 5 <sup>th</sup> edition by Sullivan & Sullivan, published by Prentice Hall

**PREREQUISITE**

At least a 75% average in three years of high school mathematics (including trigonometry) or at least a C in MAT 109.

**CATALOG DESCRIPTION**

This is a preparatory course for the study of calculus. The function concept plays a unifying role in the study of polynomial, rational, exponential, logarithmic, and trigonometric functions. Modeling, using elementary functions, is stressed throughout the course, along with a basic philosophy of examining the function concept using the Rule of Four, i.e., every topic should be presented graphically, numerically, analytically, and verbally. Technological support using a graphing calculator or appropriate computer software is integrated throughout the semester.

**MATH CENTER REQUIREMENT**

As part of this course, students should avail themselves of further study and/or educational assistance available in the Mathematics Center: B-130. These activities and use of the resources provided are deemed an integral part of the course, and will help students master necessary knowledge and skills.

**OBJECTIVES**

General

- To prepare students for the Calculus sequence and acquaint students with topics that are necessary in the science and business fields.
- To develop the basic concepts of functions and modeling that are used with respect to various frameworks of application.

## Specific

### *Philosophy*

A major objective of MAT 111 is to prepare students for higher level mathematics courses, particularly the Calculus experience. Because these Calculus courses are involved in the Harvard Calculus Curriculum Project, instructors of MAT 111 should attempt to analyze all topics using the approach advocated by this program. Two basic principles are central to teaching MAT 111:

1. The Rule of Four: Topics should be presented graphically, numerically, algebraically, and verbally.
2. The Way of Archimedes: Formal definitions and procedures evolve from the investigation of practical problems.

These two principles lead to a fundamental approach to topics that places critical thinking skills and the ability to use technology at the core of MAT 111.

### *Critical Thinking Skills*

The most difficult and most necessary aspect of revitalizing Pre-Calculus is getting our students to think. Many of the applied problems presented in this course may be solved by more than one approach. Consequently, there needs to be less emphasis in MAT 111 on “plug and chug” pencil and paper mathematics. It is recommended that instructors often discuss the practicality and common sense of the problems and solutions. Furthermore, the instructor should represent solutions through The Rule of Four, where applicable.

### *Technology:*

The use of technology is an integral and required component of the MAT 111 course. More complex functions that otherwise cannot be presented can be modeled by using the technology on real-life data sets. This enables students to explore these models in the context of real-life applications. The Texas Instruments graphing calculator, model 83, 84, 85, or 86, is recommended to help the instructor and student accomplish these tasks.

## TOPICS

In general, functions and graphs are to be presented using real data. Linear, quadratic, polynomial, rational, exponential, logarithmic, and trigonometric functions are to be presented and studied using The Rule of Four, with The Way of Archimedes to be applied, where appropriate. The use of technology in graphing, solving equations, and modeling each of the elementary functions should be emphasized. Specifically, the following concepts are to be covered.

*SUGGESTED OUTLINE FOR FUNCTIONS MODELING CHANGE BY CONNALLY, HUGHES-HALLETT, ET. AL.*

Please note that all of these topics must be covered in the course.

<b>Week</b>	<b>Topics</b>
1	Function notation, Rate of Change
2	Linear Functions, Formulas of Linear Functions and Models
3 – 4	Domain and Range, Piece-Wise Functions, Inverse Functions, Concavity
5	Exam 1. Quadratic Functions
6 -7	Exponential Functions and models, Growth and the number $e$
8	Logarithmic Functions
9	Transformations of Functions and their Graphs; Quadratic Functions (sec.2.6 and 5.5). Exam 2
10 - 11	Degree and Radian Measure, Introduction to Trigonometric Functions via the unit circle.  Trigonometric Functions and their Graphs (Sine, Cosine, Tangent, Cotangent, Secant and Cosecant Functions), General Graphs (amplitude, period, phase shifts, horizontal shifts, midline)
12	Inverse Trigonometric Functions and their Graphs, Solving Trigonometric Equations, Trigonometric Identities.
13-14	Exam 3. Inverse Functions, Polynomial and Rational Functions
15	Final Exam (exam 4)

DATE LAST REVISED

January 2012