

NASSAU COMMUNITY COLLEGE  
DEPARTMENT OF MATHEMATICS/COMPUTER SCIENCE/  
INFORMATION TECHNOLOGY  
Course Outline for

**MAT 122**  
**Calculus I**

Curriculum	Interdisciplinary
Lab hours	None
Semesters offered	Indicated in Catalog
Length of semester	15 Weeks
Class hours	4.5
Credits	4
Text	Calculus (Single Variable), 5 <sup>th</sup> ed. by Hughes-Hallett et al., published by Wiley

**PREREQUISITE**

A minimum average grade of 75 in high school precalculus or at least a C in MAT 111 or MAT 117. Students must have satisfied all MAT, ENG and RDG 001 remediation requirements prior to starting the course.

**CATALOG DESCRIPTION**

Definitions of limit, continuity and derivative; rates of change, tangent to a curve; derivatives of elementary functions, products, quotients, chain rule; higher order, implicit and inverse differentiation; mean value theorem; maxima and minima; differentials; definition of the definite integral, Fundamental Theorem of Integral Calculus; applications; integration of elementary functions.

**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 the student master necessary knowledge and skills.

**OBJECTIVES**

**General**

The course has been designed to give mathematically mature students the ability to apply mathematical ideas to specific situations. It successfully balances graphical, numerical and analytical aspects with practical technique, drill and applications.

**Specific**

This course includes topics covered in a first course in calculus: differentiation techniques with applications and basic integration with applications, including integration by substitution.

## TOPICS

- A LIBRARY OF FUNCTIONS

- review of functions represented by tables, graphs and formulas: linear, exponential, power, logarithmic, trigonometric, polynomial and rational functions
  - combinations of functions and inverses
  - introduction to continuity and limits
- 5 class sessions, including exam(s)

- THE DERIVATIVE

- definitions of velocity
  - average and instantaneous rate of change
  - the derivative as a limit
  - estimating and computing derivatives from a graph, table of values or formula
  - interpretations of the derivative as rate of change, instantaneous velocity and slope
  - higher order derivatives
  - second derivatives as concavity and acceleration
- 7 class sessions, including exam(s)

- SHORT-CUTS TO DIFFERENTIATION

- derivative formulas for polynomial, exponential, logarithmic, trigonometric and inverse trigonometric functions
  - product and quotient rules
  - chain rule
  - implicit differentiation
  - tangent line approximation
- 7 class sessions including exam(s)

- USING THE DERIVATIVE

- local/global maxima and minima
  - first and second derivative tests
  - concavity and inflection points
  - optimization
  - applications of marginality
  - L'Hopital's rule
  - local linearity
  - rates and related rates
- 8 class sessions, including exam(s)

- THE DEFINITE INTEGRAL

- definite integral as distance traveled given a rate function
- Riemann sums and the definition of definite integral
- interpretation and properties of the definite integral
- the definite integral as limit of right-hand or left-hand sums

- the Fundamental Theorem of Calculus
  - estimating the definite integral from a graph, table of values or formula
- 7 class sessions, including exam(s)

- **CONSTRUCTING ANTIDERIVATIVES**

- the antiderivative from a graphical, numerical and an analytical approach
- the indefinite integral
- the antiderivatives, and its properties
- differential equations

6 class sessions, including exam(s)

- **Chapter 7: INTEGRATION**

- integration by “ $u$ ” substitution

4 class sessions, including exam(s)

### **COURSE OUTLINE**

<u>Topic</u>	<u>Chapter</u>	<u>Sections</u>
A Library of Functions	1	1, 2, 3, 4, 5, 6, 7, 8
Key Concept: The Derivative	2	1, 2, 3, 4, 5, 6
Short-cuts to Differentiation	3	1, 2, 3, 4, 5, 6, 7, 9
Using the Derivative	4	1, 2, 4, 6, 7 (only L'Hopital's Rule)
Key Concept: The Definite Integral	5	1, 2, 3, 4
Constructing Antiderivatives	6	1, 2, 3, 5
Integration	7	1

### REFERENCES

1. Calculus with Analytic Geometry, by Anton (Wiley).
2. Calculus with Analytic Geometry, by Larson & Hostetler ( D.C. Heath & Company).
3. Calculus with Analytic Geometry, by Stewart, Wadsworth.
4. Analytic Geometry and the Calculus, by Goodman (MacMillan).
5. Calculus by Grossman (Academic Press).
6. Calculus by Gillet (D.C. Heath & company)..
7. Calculus and Analytic Geometry by Mizrahi and Sullivan (Wadsworth)..
8. Calculus and Analytic Geometry by Thomas, Finney (Addison-Wesley). Spring

DATE LAST REVISED  
SUMMER 2012