SUFFOLK COMMUNITY COLLEGE
MATHEMATICS DEPARTMENT
STUDENT COURSE OUTLINE/SYLLABUS
MA87 - Summer 2008

INSTRUCTOR:	Dr. James Fulton	**OFFICE**:	R345
COURSE:	MA87- Calculus with Analytic Geometry I	**CREDITS:**	4
SECTION:	3527, MTWT 8:00-10:15AM	**OFFICE HOURS**:	
CLASSROOM:	R201		By Appointment
PREREQUISITE:	C or better in MA61, MA 68 or MA 70	**E-MAIL:**	
TELEPHONE:	451-4257 (Prof. Fulton)		fultonj@sunysuffolk.edu
	451-4270 (Secretary)		

Copies of the detailed departmental syllabus for this course are available in the Math Office (R352).

COURSE PHILOSOPHY:

MA 87 is the first course in a calculus sequence designed for students in the mathematics, science, engineering, and computer science curricula. Emphasis will be on the understanding of concepts, problem solving techniques and strategies, and precision of mathematical thought. Understanding of major ideas (the derivative, continuity, limits, the antiderivative, the definite integral and their applications) will be approached from numerical, graphical, and symbolic points of view. The use of technology (such as the TI 84 or TI 86 graphing calculator or computers) to illustrate and enhance the understanding of key concepts in the course from the numerical and graphical points of view is appropriate, strongly encouraged, and highly desirable. Students are expected to be able to use technology to present convincing numerical and/or graphical evidence of solutions to various problems in the course. Students are advised to follow this course with MA 88 since the approach in both courses is consistent, and other institutions may have a different order of topics in their sequence.

COURSE OBJECTIVES:

Upon successful completion of this course, students should be able to:

1. Use the definition of limits to calculate the value of limits; use technology to calculate the value of limits.
2. Apply the relationship between infinite limits and asymptotes to the sketching of graphs of functions; use technology to simulate asymptotic behavior numerically.
3. Apply the concept of continuity to polynomial, rational, composite, trig, exponential, and logarithm functions.
4. Show and apply the relationship among the tangent to a graph of a function, the difference quotient, the two forms of the definition of the derivative, continuity, and differentiability.
5. Compute the derivative of polynomial, rational, trigonometric, exponential, and logarithmic functions. Compute derivatives using the product rule, the quotient rule, and the chain rule.
6. Apply the concept of derivatives to related rates, optimization problems, curve sketching, higher order derivatives, implicit differentiation.
7. Calculate the Taylor polynomial (degree 1,2, & 3) approximation to a function.
8. Use summation formulae to evaluate Riemann sums. Use Riemann sums to approximate the definite integral.
9. Find antiderivatives of polynomial functions and those functions whose derivatives are known.
10. State and apply the results of the Mean Value Theorem, the Fundamental Theorem of the Calculus, and the average value of a function.
11. Use definite integrals to calculate the area between curves.

COLLEGE-WIDE ATTENDANCE POLICY:

All students are expected to attend every session of each course for which they are registered. Students are

responsible for all that transpires in class whether or not they are in attendance. The College defines excessive absence or lateness as more than the equivalent of one week of class meetings during the semester. Excessive absence or lateness may lead to failure in a course or removal from the class roster.

GRADING POLICY:

1. There will be four (4) exams. The lowest exam grade will be dropped.
2. There are no make-up exams.
3. There will be a comprehensive final examination. The final exam grade may not be dropped.
4. Your course average will be determined as follows:

   Exams.....…75%
   Final Exam.....25%

REQUIRED TEXTBOOK:

Calculus – Concepts and Contexts – Single Variable , 3rd Ed.
James Stewart; Thomson Publishing

TESTS & TOPICS:

The following sections will be covered in the textbook and tests will be given after the last section is completed. Changes may be made as the summer progresses. You can expect a test approximately every other week.

Sections: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7	REVIEW MATERIAL NOT ON EXAM SPECIFICALLY
Sections: 2.2, 2.3, 2.4, 2.5, 2.7, 2.8, 2.9	TEST 1
Sections: 3.1, 3.2, 3.4, 3.5, 3.6, 3.7, 3.8	TEST 2
Sections: 4.1, 4.2, 4.3, 4.4, 4.6, 4.8, 4.9	TEST 3
Sections: 5.1, 5.2, 5.3, 5.4, 6.1, 6.4	TEST 4

TENTATIVE SCHEDULE

DATE	DAY	SECTIONS	TESTS
6/4	Monday	1.1-1.4	
6/5	Tuesday	1.5- 1.7	
6/61	Wednesday	2.1, 2.2	
6/7	Thursday	2.3, 2.4	
6/11	Monday	2.5, 2.7	
6/12	Tuesday	2.8, 2.9	
6/13	Wednesday	Review	
6/14	Thursday		Test 1: Limits & Derivatives
6/18	Monday	3.1, 3.2	
6/19	Tuesday	3.1, 3.2	
6/20	Wednesday	3.4, 3.5	
6/21	Thursday	3.6, 3.7	
6/25	Monday	3.8	
6/26	Tuesday	Review	
6/27	Wednesday		Test 2: Differentiation Rules
6/28	Thursday	4.1, 4.2	
6/30	Monday	4.3, 4.4	
7/1	Tuesday	4.5, 4.6	
7/2	Wednesday	4.8	
7/3	Thursday	4.8, 4.9	
7/7	Monday	Review	
7/8	Tuesday		Test 3: Applications of Differentiation
7/9	Wednesday	5.1	
7/10	Thursday	5.2, 5.3	

7/14	Monday	5.4	
7/15	Tuesday	6.1	
7/16	Wednesday	Review	
7/17	Thursday		Test 4: Integrals & Some Applications
7/21	Monday	Review	
7/22	Tuesday		Final Exam

REQUIRED CALCULATOR:

A graphing calculator will be used throughout the course and will be required. Various types of graphing calculators can be used, but the student is responsible for determining how to duplicate the functions of the TI-84 on their calculator as the instructor may not have knowledge of all comparable calculators.

MATH LEARNING CENTER

Software, Videotapes, Audiotapes, and Departmental Internet Resources along with tutoring are all available in the Mathematics Learning Center (R235) – see the director for further details.

TOPIC OUTLINE:

Core Topics:

I. Limits and Continuity
- a) definition of limit of a function
  - 1) definition
  - 2) calculation of limit
- b) limit theorems:
  - 1) calculation of limits
  - 2) proofs of some basic limit theorems (such as sum, product & quotient)
- c) "one-sided" limits:
  - 1) definitions
  - 2) calculations
- d) infinite limits:
  - 1) definitions
  - 2) calculations
  - 3) asymptotes, sketching
- e) limits at infinity:
  - 1) definitions
  - 2) calculations
  - 3) asymptotes, sketching
- f) continuity:
  - 1) definitions
  - 2) essential (non-removable) and removable discontinuities
  - 3) theorems on continuity (with applications)
- g) continuity on an interval:
  - 1) arithmetic of continuous functions
  - 2) polynomial functions
  - 3) rational functions
  - 4) radical functions
  - 5)Composite functions
- h) continuity of trigonometric functions:
  - 1) the "squeeze" theorem
- i) limit and continuity theorems applied to sine and cosine justified using a numerical approach.
  - i. $\lim_{t\to o}\frac{\sin t}{t}=1$
  - ii. sine and cosine functions are continuous at 0
  - iii. $\lim_{t\to 0}\frac{1-\cos t}{t}=0$
- j) continuity of log and exponential functions

II. The Derivative
- a) the tangent and normal lines to a curve:
  - 1) definitions
  - 2) calculations
- b) the derivative:
  - 1) definition and relationship to tangent line
  - 2) alternative forms of the definitions of a derivative
  - 3) definitions of differentiability
- c) relationship between differentiability and continuity:
  - 1) differentiability implies continuity
  - 2) "one-sided" derivatives
- d) derivation of the rules for differentiation of algebraic functions
- e) derivatives as rates of change
- f) derivatives of all trigonometric functions

g) derivatives of exponential and log functions
h) derivatives of composite functions (the chain rule)
i) derivatives of power functions
j) implicit differentiation
k) higher order derivatives

III. Applications of the Derivative:
a) differentiation applied to related rates
b) differentiation applied to finding maximum and/or minimum values of function:
1) over the domain of real numbers
2) on a closed interval
3) absolute and relative extrema
c) Mean Value Theorem
d) increasing and decreasing functions
1) definitions: increasing, decreasing, monotonic
2) first derivative test for extrema
3) second derivative test for extrema
e) concavity and inflection:
1) definitions
2) use of second derivatives
3) points of inflection
f) curve sketching
g) Taylor Polynomial Approximations

IV. The Differential and Antiderivative:
a) the differential
1) definitions (dx, dy)
2) approximation of values of functions
b) antidifferentiation
1) definition of antiderivative
2) "rules" of antidifferentiation
3) "Chain Rule" for antidifferentiation
c) applications:
1) differential equations
2) antidifferentiation applied to rectilinear motion

V. The Definite Integral:
a) summation techniques
b) finding area under a curve by summation and limits
c) the definite integral
1) definitions (Riemann sum, integrable, definite integral, limits of integration, area
2) properties
d) Riemann Sum Approximations
e) the average value of a function
f) the Fundamental Theorem of the Calculus

VI. Applications of the Definite Integral
a) area between curves
1) horizontal increments of area
2) vertical increments of area