Course Syllabus

Department: Mathematics

Date: April 4, 2013

I. Course Prefix and Number: MAT 271

Course Name: Calculus 1

Credit Hours and Contact Hours: 4 Credit Hours – 4 Contact Hours

Catalog Description including pre- and co-requisites: supporting data required for grade prerequisite of ‘C’ or higher.

A first course in Calculus focusing on the mathematics of changing rates. The derivative of polynomial and transcendental functions is investigated from a numerical, graphical, and algebraic approach. Applications for the use of derivatives are also explored. Introduction to the definite integral and the Fundamental Theorem of Calculus is included in this course. Graphing calculator required.

Prerequisite: MAT 152 or Placement into Math Level 4.

Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:

This course is a service course that fulfills mathematics/science course requirements for many A.S., A.A. and A.A.S. degrees.

This course carries SUNY Gen Ed Mathematics credit.

II. Course Student Learning Outcomes: State the student learning outcome(s) for the course (e.g. Student will be able to identify…)

Upon completion of the course the student will be able to:

a. Find and interpret the average and instantaneous rate of change of a function.
b. Find derivatives numerically, algebraically and graphically.
c. Interpret the derivative of a function.
d. Apply derivatives to solve problems.
e. Use numerical, graphical, and algebraic techniques to find solutions to a variety of problems.
f. Interpret the meaning of a definite integral.
g. Use Riemann sums to evaluate a definite integral.
h. Apply the Fundamental Theorem of Calculus.

College Learning Outcomes Addressed by the Course: (check each College Learning Outcome addressed by the Student Learning Outcomes)

☐ writing
☐ computer literacy
☐ oral communications
☐ ethics/values
### III. Assessment Measures (Summarize how the college and student learning outcomes will be assessed):

For each identified outcome checked, please provide the specific assessment measure.

<table>
<thead>
<tr>
<th>List identified College Learning Outcomes(s)</th>
<th>Specific assessment measure(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>Possible evaluation methods include quizzes, tests, portfolios, collected assignments, group activities, et. al. All work throughout the course will involve mathematics.</td>
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<tr>
<td>Reading</td>
<td>On most evaluation methods students will need to read questions carefully. Students will also need to use the textbook to complete homework assignments.</td>
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<tr>
<td>Critical Thinking</td>
<td>On most evaluation methods students will be asked to approach problems in new ways.</td>
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### IV. Instructional Materials and Methods

**Types of Course Materials:**
- Textbook: Selected by department.
- Calculator: TI-83 or TI-84

**Methods of Instruction (e.g. Lecture, Lab, Seminar …):**
1. Lecture
2. Discussion
3. Demonstration
4. Group activities
5. Labs/projects

### V. General Outline of Topics Covered:

1) Review as needed library of functions.
   a) Linear Functions
   b) Exponential Functions
   c) Power Functions
   d) Inverse Functions
   e) Logarithmic Functions
   f) Natural Logarithmic Functions
   g) Composite Functions
   h) Trigonometric Functions
   i) Polynomial and Rational Functions
2) The Derivative  
   a) derivative at a point  
   b) derivative function  
   c) interpretations of the derivative as a rate of change  
   d) relationship between first and second derivatives with respect to behavior of a function  
   e) approximations and local linearity  
   f) limits, continuity and differentiability  

3) Formulas for derivative of a:  
   a) constant function  
   b) power function  
   c) polynomial function  
   d) exponential function  
   e) logarithmic function  
   f) hyperbolic function  
   g) trigonometric function  

4) Differentiation Techniques  
   a) product and quotient rules  
   b) chain rule and its application  
   c) implicit differentiation  

5) Applications of the Derivative  
   a) Using the graphs of the first and second derivative to interpret characteristics of the original function.  
   b) finding extrema and inflection points on an interval  
      i) Optimization in problem solving  
      ii) Newton's Method (OPTIONAL)  

6) The Definite Integral  
   a) interpretations of the definite integral  
   b) definite integral as area and average using Riemann Sums  
   c) Fundamental Theorem of Calculus  

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