MERRITT COLLEGE COURSE OUTLINE

COLLEGE:		**STATE APPROVAL DATE:**	09/27/2010
ORIGINATOR:	Tae-Soon Park	**STATE CONTROL NUMBER:**	CCC00036 0280
		BOARD OF TRUSTEES APPROVAL DATE:	01/26/2016
		CURRICULUM COMMITTEE APPROVAL DATE:	04/26/2018
		CURRENT EFFECTIVE DATE:	04/23/2018

DIVISION/DEPARTMENT:

1. REQUESTED CREDIT CLASSIFICATION:

Credit - Degree Applicable
Course is not a basic skills course.
Program Applicable

2. DEPT/COURSE NO:

MATH 003A

3. COURSE TITLE:

Calculus I

4. COURSE: MC Course Modification

TOP NO. 1701.00

5. UNITS: 5.000

HRS/WK LEC: 5.00 **Total:** 87.50
HRS/WK LAB:

6. NO. OF TIMES OFFERED AS SELETED TOPIC: **AVERAGE ENROLLMENT:**

7. JUSTIFICATION FOR COURSE:

Course satisfies GE area 4b requirements as well as UC/CSU transfer requirements and degree requirements in Mathematics, and provides a foundation for more advanced students in mathematics and related fields (e.g., physics).

8. COURSE/CATALOG DESCRIPTION

Theorems on limits and continuous functions, derivatives, differentials and applications: Fundamental theorems of calculus and applications; properties of exponential, logarithmic, and inverse trigonometric functions, and hyperbolic functions.

9. OTHER CATALOG INFORMATION

a. Modular: No If yes, how many modules:
b. Open entry/open exit: No
c. Grading Policy: Letter Grade Only
d. Eligible for credit by Exam: No
e. Repeatable according to state guidelines: No
f. Required for degree/certificate (specify):
Mathematics, Mathematics
g. Meets GE/Transfer requirements (specify):
h. C-ID Number: MATH 210 Expiration Date:

i. Are there prerequisites/corequisites/recommended preparation for this course? Yes
Date of last prereq/coreq validation: 09/07/2014
j. Acceptable for Credit: CSU/UC

10. LIST STUDENT PERFORMANCE OBJECTIVES (EXIT SKILLS): (Objectives must define the exit skills required of students and include criteria identified in Items 12, 14, and 15 - critical thinking, essay writing, problem solving, written/verbal communications, computational skills, working with others, workplace needs, SCANS competencies, all aspects of the industry, etc.)(See SCANS/All Aspects of Industry

Worksheet.)

Students will be able to:

1. Compute limits of functions at a point.
2. Determine whether functions are continuous.
3. Find the derivative of a function as a limit.
4. Compute derivatives using differentiation formulas.
5. Find the equation of the tangent line to a differentiable function at a point.
6. Use differentiation techniques (including implicit differentiation) to solve applications such as related rate problems and optimization problems.
7. Find derivatives of inverse functions.
8. Find derivatives and antiderivatives of inverse trigonometric functions.
9. Use the first and second derivatives to examine aspects of slope and concavity.
10. Graph functions using methods of calculus (compute critical values, inflection points and other aspects of graphs).
11. Evaluate definite integrals as limits and by using the Fundamental Theorem of Calculus.
12. Use integration to find areas.
13. Think logically through assessing given information, exploring alternative approaches, and arriving at conclusions based on evidence and the application of an applicable concept.

11A. COURSE CONTENT: List major topics to be covered. This section must be more than listing chapter headings from a textbook. Outline the course content, including essential topics, major subdivisions, and supporting details. It should include enough information so that a faculty member from any institution will have a clear understanding of the material taught in the course and the approximate length of time devoted to each. There should be congruence among the catalog description, lecture and/or lab content, student performance objectives, and the student learning outcomes. List percent of time spent on each topic; ensure percentages total 100%.

LECTURE CONTENT:

1. Limits and Continuous Functions: 15%
a. Review of functions and graphs
b. Definition and computation of limits using numerical, graphical, and algebraic approaches
c. Continuous functions
d. Maximum-value Theorem
e. Intermediate-value Theorem

2. The Derivative: 20%
a. Definition of the derivative as a limit
b. Interpretation of the derivative as: slope of tangent line, a rate of change
c. Derivative computations (including constants, power rule, product rule, quotient rule, chain rule and higher order derivatives)
d. Derivatives of transcendental functions such as trigonometric, exponential, and logarithmic functions

3. Application of the Derivative 25%
a. Rolle’s Theorem and the Mean-value Theorem
b. Graphing functions using first and second derivatives, concavity, and asymptotes
c. Motion problems
d. Applied maximum and minimum problems
e. Implicit differentiation and related rates
f. The differential
g. Indeterminate forms and L’Hospital’s Rule

4. Integration: 20%
a. Antiderivatives and indefinite integrals
b. Area under a curve

c. Riemann sums and definite integral
d. Properties of integrals and Fundamental Theorem of Calculus
e. Integration by substitution

5. Topics in Differential Calculus 20%
a. Differentiation of inverse functions
b. Logarithmic functions; their derivatives and integrals

c. Trigonometric functions; their derivatives and integrals
d. Exponential functions; their derivatives and integrals
e. Inverse trigonometric functions; their derivatives and integrals
f. The hyperbolic and inverse hyperbolic functions; their derivatives and integrals

11B. LAB CONTENT:
n/a

12. METHODS OF INSTRUCTION (List methods used to present course content.)

1. Other (Specify)
2. Discussion
3. Lecture

Other Methods:
Demonstrations which emphasize alternative approaches and their underlying rationale

13. ASSIGNMENTS: 0.00 hours/week (List all assignments, including library assignments. Requires two (2) hours of independent work outside of class for each unit/weekly lecture hour. Outside assignments are not required for lab-only courses, although they can be given.)

Out-of-class Assignments:
1. Assigned reading materials and project(s). 2. Solving problem sets equivalent in content and level of difficulty to those covered in the lectures. 3. Solving problems that introduce supplemental concepts and formulas and require synthesizing of various concepts.

ASSIGNMENTS ARE: (See definition of college level):
Primarily College Level

14. STUDENT ASSESSMENT: (Grades are based on):
COMPUTATION SKILLS
NON-COMPUTATIONAL PROBLEM SOLVING (Critical thinking should be demonstrated by solving unfamiliar problems via various strategies.)
SKILL DEMONSTRATION
OTHER (Describe):
Quizzes, unit tests, examinations, project(s), and final exam which include problem solving questions where students demonstrate their ability to devise, organize and present complete solutions to problems.

Why "ESSAY" is not checked:
Assessment techniques employed are those typical for lower-division (transferable) college math courses, involving primarily skill-based classroom exams and homework assignments, many of which require critical thinking skills. Lengthy essays are not part of the classroom assignments in this course.

15. TEXTS, READINGS, AND MATERIALS

A. Textbooks:

Larson,Ron and Edwards, Bruce H.. 2014. *Calculus* 10th . Cengage Learning

Stewart, J. 2012. *Calculus: Early Transcendentals* 7th. Cengage Learning

*Date is required: Transfer institutions require current publication date(s) within 5 years of outline addition/update.

B. Additional Resources:

Library/LRC Materials and Services:

The instructor, in consultation with a librarian, has reviewed the materials and services of the College Library/LRC in the subject areas related to the proposed new course

Are print materials adequate? Yes

Are nonprint materials adequate? Yes

Are electronic/online resources available? Yes

Are services adequate? Yes

Specific materials and/or services needed have been identified and discussed. Librarian comments:

C. Readings listed in A and B above are: (See definition of college level):

Primarily college level

16. DESIGNATE OCCUPATIONAL CODE:
E - Non-Occupational

17. LEVEL BELOW TRANSFER:
Y - Not Applicable

18. CALIFORNIA CLASSIFICATION CODE:
Y - Credit Course

19. NON CREDIT COURSE CATEGORY:
Y - Not Applicable

20. FUNDING AGENCY CATEGORY:
Not Applicable - Not Applicable

SUPPLEMENTAL PAGE

Use only if additional space is needed. (Type the item number which is to be continued, followed by "continued." Show the page number in the blank at the bottom of the page. If the item being continued is on page 2 of the outline, the first supplemental page will be "2a." If additional supplemental pages are required for page 2, they are to be numbered as 2b, 2c, etc.)

1a. Prerequisites/Corequisites/Recommended Preparation:

PREREQUISITE:
- MATH 002: Precalculus with Analytic Geometry

or

PREREQUISITE:
- MATH 001: Pre-Calculus

and

PREREQUISITE:
- MATH 050: Trigonometry

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STUDENT LEARNING OUTCOMES

1. **Outcome:** Compute derivatives of functions using a variety of techniques for graphical analysis.
   This outcome maps to the following Institution Outcomes:
   • Critical Thinking - Think critically using appropriate methods of reasoning to evaluate ideas and identify and investigate problems and to develop creative and practical solutions to issues that arise in workplaces, institutions, and local and global communities.

• Quantitive Reasoning - Apply college-level mathematical reasoning to analyze and explain real world issues and to interpret and construct graphs, charts, and tables.

Assessment: exam, essay, student project, written exercise, skill demonstration

2. **Outcome:** Apply the concept of anti-differentiation to solve basic integration problems.
   This outcome maps to the following Institution Outcomes:
   • Critical Thinking - Think critically using appropriate methods of reasoning to evaluate ideas and identify and investigate problems and to develop creative and practical solutions to issues that arise in workplaces, institutions, and local and global communities.
   • Quantitive Reasoning - Apply college-level mathematical reasoning to analyze and explain real world issues and to interpret and construct graphs, charts, and tables.

   Assessment: exam, essay, student project, written exercise, skill demonstration

3. **Outcome:** Construct and solve mathematical models involving related rates and optimization (maximum and minimum problems).
   This outcome maps to the following Institution Outcomes:
   • Critical Thinking - Think critically using appropriate methods of reasoning to evaluate ideas and identify and investigate problems and to develop creative and practical solutions to issues that arise in workplaces, institutions, and local and global communities.
   • Quantitive Reasoning - Apply college-level mathematical reasoning to analyze and explain real world issues and to interpret and construct graphs, charts, and tables.

   Assessment: exam, essay, student project, written exercise, skill demonstration

4. **Outcome:** Model natural phenomena using logarithms and exponentials
   This outcome maps to the following Institution Outcomes:
   • Critical Thinking - Think critically using appropriate methods of reasoning to evaluate ideas and identify and investigate problems and to develop creative and practical solutions to issues that arise in workplaces, institutions, and local and global communities.
   • Quantitive Reasoning - Apply college-level mathematical reasoning to analyze and explain real world issues and to interpret and construct graphs, charts, and tables.

   Assessment: exam, essay, student project, written exercise, skill demonstration

5. **Outcome:** Analyze the properties of inverse trigonometric functions, their derivatives and anti-derivatives
   This outcome maps to the following Institution Outcomes:
   • Critical Thinking - Think critically using appropriate methods of reasoning to evaluate ideas and identify and investigate problems and to develop creative and practical solutions to issues that arise in workplaces, institutions, and local and global communities.
   • Quantitive Reasoning - Apply college-level mathematical reasoning to analyze and explain real world issues and to interpret and construct graphs, charts, and tables.

   Assessment: exam, essay, student project, written exercise, skill demonstration

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