MERRITT COLLEGE COURSE OUTLINE

COLLEGE:		**STATE APPROVAL DATE:**	09/19/2007
ORIGINATOR:	Tae-Soon Park	**STATE CONTROL NUMBER:**	CCC00035 4426
		BOARD OF TRUSTEES APPROVAL DATE:	05/20/2008
		CURRICULUM COMMITTEE APPROVAL DATE:	04/26/2018
		CURRENT EFFECTIVE DATE:	

DIVISION/DEPARTMENT:

1. REQUESTED CREDIT CLASSIFICATION:

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

2. DEPT/COURSE NO:

MATH 003C

3. COURSE TITLE:

Calculus III

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

Partial differentiation, Jacobians, transformations, multiple integrals, theorems of Green and Stokes, differential forms, vectors and vector functions, geometric coordinates, and vector calculus.

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 230 Expiration Date:

i. Are there prerequisites/corequisites/recommended preparation for this course? Yes
Date of last prereq/coreq validation: 09/20/2015
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. Perform algebraic operations on vectors.
2. Determine vector and parametric equations of lines and planes.
3. Find the limit of a function of several variables at a given point.
4. Evaluate derivatives of vector functions and real-valued functions in several variables.
5. Find the equation of a tangent plane at a point.
6. Determine the differentiability of a function.
7. Test for saddle points and find local and global extrema.
8. Use Lagrange multipliers to solve constraint problems.
9. Compute arc length.
10. Find the curl and divergence of a vector field.
11. Compute multiple (two-and three-dimensional) integrals.
12. Use multiple integrals to find area, volume, density, center of mass, moments of inertia.
13. Apply Green's Theorem, Stokes' Theorem and the Divergence Theorem.

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. Vectors in Two and Three Dimensions: 20%

   a. Algebraic operations on vectors in R2 and R3
   b. Dot product and projections
   c. Cross product and triple product
   d. Vector and parametric equations of lines and planes
   e. Rectangular equation of a plane
   f. Cylinders and quadric surfaces

2. Vector Functions: 20%

   a. Vector-valued functions and space curves
   b. Differentiability including higher-order derivatives and integrals of vector-valued functions
   c. Velocity and acceleration
   d. Tangent, normal and binormal vectors
   e. Arc length and curvature

3. Real-valued Functions of Several Variables: 20%

   a. Graphs; level curves and surfaces
   b. Limits and continuity; properties of limits and continuous functions
   c. Partial derivatives; differentiability
   d. Tangent planes, linear approximations, differentials
   e. Chain rule
   f. Higher order partial derivatives
   g. Directional derivatives and gradient vectors
   h. Critical points, saddle points, local and global extrema
   i. Lagrange multipliers

4. Multiple Integration: 20%

   a. Iterated integrals; plane areas
   b. Double integrals over rectangles and regions; volume
   c. Double integrals in polar coordinates
   d. Applications of multiple integration: area, volume, center of mass, moments of inertia
   e. Triple integrals in rectangular, cylindrical and spherical coordinates
   f. Coordinate transformations and the Jacobian
   g. Change of variables Theorem

5. Vector Calculus: 20%

a. Vector fields, gradient fields, divergence, curl
b. Line integrals
c. Conservative vector fields and independence of path
d. Green's Theorem
e. Parametrically defined surfaces
f. Integrals of real-valued functions over surfaces
g. The Divergence Theorem with applications
h. Stokes' Theorem with applications

11B. LAB CONTENT:
n/a

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

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

Other Methods:
Demonstrations emphasizing alternative approaches

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. 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):
ESSAY (Includes "blue book" exams and any written assignment of sufficient length and complexity to require students to select and organize ideas, to explain and support the ideas, and to demonstrate critical thinking skills.)
COMPUTATION SKILLS
NON-COMPUTATIONAL PROBLEM SOLVING (Critical thinking should be demonstrated by solving unfamiliar problems via various strategies.)
SKILL DEMONSTRATION

15. TEXTS, READINGS, AND MATERIALS

A. Textbooks:

Hughes-Hallett, et. al. 2013. *Multivariable Calculus* 6th. Wiley

Larson, Ron and Edwards, Bruce H. 2014. *Calculus* 10th . Houghton Mifflin
Rationale: -

Stewart, James. 2016. *Calculus, Early Transcendentals* 8th. 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? No

Are electronic/online resources available? No

Are services adequate? No

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 003B: Calculus II or (4C)

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STUDENT LEARNING OUTCOMES

1. **Outcome:** Expand basic principles of calculus to model physical systems in 3-dimensions.
   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, written exercise, skill demonstration

2. **Outcome:** Apply appropriate vector operations to solve a variety of real world phenomena.
   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, written exercise, skill demonstration

3. **Outcome:** Demonstrate critical understanding of various methods to analyze and solve abstract and real world 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, written exercise, skill demonstration

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