MATH 221 - Multivariable Calculus Course Outline

Approval Date: 05/20/2013
Effective Date: 08/11/2013

SECTION A

Unique ID Number	CCC000522978
Discipline(s)	
Division	Mathematics
Subject Area	Mathematics
Subject Code	MATH
Course Number	221
Course Title	Multivariable Calculus
TOP Code/SAM Code	1701.00 - Mathematics, General / E - Non-Occupational
Rationale for adding this course to the curriculum	Course update.
Units	5
Cross List	*N/A*
Typical Course Weeks	

Total Instructional Hours

	Contact Hours
Lecture	90.00
Lab	0.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	180.00

Total Contact Hours	90
Total Student Hours	270
Open Entry/Open Exit	No
Maximum Enrollment	
Grading Option	Letter Grade Only

Distance Education Mode of Instruction On-Campus
Hybrid
Entirely Online

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability May be repeated 0 times

Catalog Description The third semester of a three course sequence in differential and integral calculus. Topics include vector valued functions, calculus of functions of more than one variable, partial derivatives, multiple integration, Green?s Theorem, Stokes? Theorem, and divergence theorem. Primarily for majors of mathematics, engineering, and science. A Graphing Calculator is required.

Schedule Description

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- MATH 121

1b. Corequisite(s): *None*

1c. Recommended: *None*

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Differentiate and integrate vector-valued functions.
B. Calculate partial derivatives and multiple integrals.
C. Solve applications using the theorems of Green, Gauss, and Stokes.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Perform vector operations;
B. Determine equations of lines and planes;
C. Find the limit of a function at a point;
D. Evaluate derivatives;
E. Write the equation of a tangent plane at a point;
F. Determine differentiability;
G. Find local extrema and test for saddle points;
H. Solve constraint problems using Lagrange multipliers;
I. Compute arc length;
J. Find the divergence and curl of a vector field;
K. Evaluate two and three dimensional integrals;
L. Apply Green?s, Stokes?, and divergence theorems.
M.

3. Course Content

1) Vectors and vector operations in two and three dimensions;
2) Vector and parametric equations of lines and planes; rectangular equation of a plane;
3) Dot, cross, and triple products and projections;

4) Differentiability and differentiation including partial derivatives, chain rule, higher-order derivatives, directional derivatives, and the gradient;
5) Arc length and curvature; tangent, normal, binormal vectors;
6) Vector-valued functions and their derivatives and integrals; finding velocity and acceleration;
7) Real-valued functions of several variables, level curves and surfaces;
8) Limits, continuity, and properties of limits and continuity;
9) Local and global maxima and minima extrema, saddle points, and Lagrange multipliers;
10) Vector fields including the gradient vector field and conservative fields;
11) Double and triple integrals;
12) Applications of multiple integration such as area, volume, center of mass, or moments of inertia;
13) Change of variables theorem;
14) Integrals in polar, cylindrical, and spherical coordinates;
15) Line and surface integrals including parametrically defined surfaces;
16) Integrals of real-valued functions over surfaces;
17) Divergence and curl; and
18) Green's, Stokes', and divergence theorems.

4. Methods of Instruction:

Discussion:
Distance Education:
Lecture:
Other: In-class practice problems

5. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Typical classroom assessment techniques

Exams/Tests --
Quizzes --
Home Work --
Final Exam --

Additional assessment information:

Examples:

1) An exam including partial derivatives where the student would be expected to calculate the partial derivatives of a variety of different functions, find the directional derivative of a function for a given vector direction, calculate the gradient of a function and interpret its meaning, find the local max/min of a function, and use LaGrange Multipliers to find the maximum or minimum of a function given a constraint.

2) An exam including multiple integrals where the student would be expected to calculate double integrals over a variety of different regions (rectangular, general, and polar) and calculate triple integrals for a variety of different coordinate systems (rectangular, cylindrical, and spherical).

Letter Grade Only

6. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
   Read textbook, for example:
   1. Read section on directional derivative
   2. Read section on multiple integrals

B. Writing Assignments
Daily homework assignments from the text, for example:
1. Maximize f(x,y) = x^2 + 2xy + y^2
2. Find the volume above the x-y plane enclosed by the paraboloid z = 1 - x^2 - y^2.

C. Other Assignments
Other assignments such as research into applications or group projects assigned at instructors' discretion.

7. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:

Author:	Briggs, W., Cochran, L.
Title:	Calculus
Publisher:	Pearson
Date of Publication:	2010
Edition:	

B. Other required materials/supplies.

- Graphical calculator is required