MATH 0032 - ANALYTICAL GEOMETRY AND CALCULUS III

SECTION A

1. Division: Sciences & Mathematics
2. Subject Code: MATH
3. Course Number: 0032
4. Course Title: ANALYTICAL GEOMETRY AND CALCULUS III
5. Semester of First Offering: FALL 2013

SECTION B General Course Information

1.Units: 4.0 **Variable Units:** N/A
2.This Course is: Degree-Applicable Credit - Transferable
3A. Cross-List: **3B. Formerly:**

Course Format and Duration

4. Standard Term Hours per Week		**5. Standard Term Total Semester Hours**	
Lecture/Discussion:	4	Lecture/Discussion:	72
Lab:		Lab:	
Activity:		Activity:	
By Arrangement:		By Arrangement:	
Total Hours per Week:	4	**Total Hours :**	72

6. Minimum hours per week of independent work done outside the class: 8

Course Preparation - (Supplemental form B required)

7a. Prerequisite(s): (Course and/or other preparation/experience that is REQUIRED to be completed previous to enrollment in this course.)

Completion of MATH 31 with grade of "C" or better

7b. Co-requisite(s): (Courses and/or other preparation that is REQUIRED to be taken concurrently with this course.)

7c. Advisory: (MINIMUM preparation RECOMMENDED in order to be succesful in this course. Also known as "Course Advisory".)

Catalog Description And Other Catalog Information:

8. Repeatability: **Not Repeatable**

Please note: Repeatability does not refer to repeating courses because of substandard grades or a lapse of time since the student took the course. A course may be repeated only if the course content differs each time it is offered and the student who repeats it is gaining an expanded educational experience as stipulated in Title V.

- ☐ Skills or proficiencies are enhanced by supervised repetition and practice within class periods.
- ☐ Active participatory experience in individual study or group assignments is the basic means by which learning objectives are attained.
- ☐ Course content differs each time it is offered.

Explanation for above repeatability selection:

9a. Grading Option: Standard Grade

9b. Catalog Description:

Continuation of MATH 31. Vectors and analytic geometry in the plane and space; functions of several variables; partial differentiation, multiple integrals, and application problems; vector functions and their derivatives; motion in space; and surface and line integrals, Stokes' and Green's Theorems, and the Divergence Theorem.

Course Outline Information

10. Student Performance Objectives: (Performance objectives for all credit courses must indicate that students will learn critical thinking and will be able to apply concepts at college level.Performance objectives must be related to items listed in Section 11.)

1. Compute vector quantities such as the dot product and the magnitude of a vector;
2. write the equation of a line or a plane in space using vector methods;
3. solve problems dealing with the motion of a particle in the plane or in space using vectors methods;
4. calculate the length of a curve in 3-space;
5. graph and identify quadric surfaces;
6. sketch functions of two variables, level curves of functions of two variables, and level surfaces of functions of three variables;
7. find maximum and minimum values of functions of two variables and solve applied max/min problems;
8. compute partial derivatives of functions of more than one variable;
9. solve maximum and minimum problems using Lagrange multipliers;
10. evaluate double and triple integrals using rectangular, polar, cylindrical, or spherical coordinates;
11. compute area, volume, centers of mass, and moments of inertia using double and triple integration;
12. evaluate line integrals and solve related applied problems;
13. evaluate line integrals and areas using Green's Theorem;
14. compute the divergence and curve of a vector field;
15. compute the area of a parametric surface;
16. evaluate surface integrals using Stokes' Theorem and the Divergence Theorem; and
17. solve complex calculus problems using algebra and trigonometry skills.

11. Course Content Outline: (Provides a comprehensive, sequential outline of the course content, including all major subject matter and the specific body of knowledge covered.)

I. Three Dimensional Analytic Geometry and Vectors
A. Three-Dimensional Coordinate Systems
B. Vectors
C. Dot Product
D. Cross Product
E. Equations of Lines and Planes
F. Quadric Surfaces
G. Vector Functions and Space Curves
H. Arc Length and Curvature
I. Motion in Space: Velocity and Acceleration
J. Cylindrical and Spherical Coordinates
II. Partial Derivatives
A. Functions of Several Variables
B. Limits and Continuity
C. Partial Derivatives
D. Tangent Planes and Differentials
E. The Chain Rule
F. Directional Derivatives and the Gradient Vector
G. Maximum and Minimum Values
H. Lagrange Multipliers
III. Multiple Integrals
A. Double Integrals over Rectangles
B. Iterated Integrals
C. Double Integrals over General Regions
D. Double Integrals in Polar Coordinates
E. Applications of Double Integrals
F. Surface Area
G. Triple Integrals
H. Triple Integrals in Cylindrical and Spherical Coordinates
I. Change of Variable in Multiple Integrals
IV. Vector Calculus
A. Vector Fields
B. Line Integrals
C. Fundamental Theorem for Line Integrals
D. Greens' Theorem
E. Curl and Divergence
F. Parametric Surfaces and Their Areas
G. Surface Integrals
H. Stokes' Theorem
I. The Divergence Theorem

12. Typical Out-of-Class Assignments: (Credit courses **require** two hours of independent work outside of class for each lecture hour, less lab/activity classes. List type of assignments including library assignments.)

a. Reading Assignments: (Submit at least 2 examples.)

1. Read in the textbook about how vector-valued functions and their properties can be used to prove Kepler's law of planetary motion.

2. Research online topics such as Green's Theorem, Stokes' Theorem, the Divergence Theorem and their applications in the physical sciences.

b. Writing, Problem Solving or Performance: (Submit at least 2 examples)

1. Solve applied problems from physics and engineering. For example, find the magnitude and direction of the torque about a pivot on a pump handle given the force vector.

2. Work in groups to set up double and triple integrals used to compute the volume of a three dimensional region. Determine the best choice of a coordinate system and order of integration for the given situation. Write a summary of your solution technique, comparing the evaluation required for each order of integration.

c. Other (Term projects, research papers, porfolios, etc.)

13. Required Materials:

a. All textbooks, resources and other materials used in this course are college level?

- ☑ Yes
- ☐ No

b. Representative college-level textbooks (for degree applicable courses) or other print materials:

Book 1:

Author:	William Briggs and Lyle Cochran
Title:	Calculus
Publisher:	Addison-Wesley
Date of Publication:	2011
Edition:	First

c. Other materials and/or supplies required of students:

14.Check all Instructional methods used to present course content:

- ☑ Lecture
- ☑ Discussion Semminar
- ☑ Lab
- ☑ Directed Study
- ☑ Activity
- ☐ Distance Education (requires supplemental form)
- ☐ Work Experience
- ☐ Tutoring

Other:

Give detailed examples of teaching methodology that relate to the course performance objectives:
Example 1: Instructor will use an interactive lecture style to develop the concept of optimizing functions in 3 dimensions. The instructor will incorporate algebraic analysis and visual analysis through graphing. Students will participate verbally and will work several examples.

Example 2: Students will write a report on the historical origins of Green's Theorem and Stokes' Theorem. Explain the similarities and relationship between the theorems. Show how both theorems arose from the investigation of electricity and magnetism and were later used to study a variety of physical problems.

15. Methods of Assessing Student Learning
15a. Methods of Evaluation:

- ☐ Essay Exam
- ☑ Objective Exam
- ☑ Projects
- ☑ Class Discussion
- ☑ Reports
- ☑ Problem Solving Exam
- ☐ Skill Demonstration
- ☐ Other

15b. (All courses must provide for measurement of student performance in terms of stated student performance objectives, Area 10, and culminate in a formal recorded grade based on uniform standards. Submit at least 2 examples.)

Example 1: Find the maximum and minimum values of the function f(x,y) = x^2*y^3 over the region inside the triangle with vertices at (1,0), (1,1), and (0,0).
This problem is graded based upon the correctness of the solution and the choice of technique.

Example 2: Set up two double integrals to compute the area of the region bounded by the line y = x and the parabola y = 4x - x^2.
This problem is graded based upon a correct sketch of the region, correctly setting the double integrals, and correctly evaluating the integral.

SECTION C

1. Program Information:

- ☑ In an approved program
- ☐ Part of a new program
- ☐ Not part of an approved program

2. TOP Code Information

Program Title: Mathematics, General 170100

3. Course SAM Code:

- ☐ A - Apprenticeship Course
- ☐ B - Advanced Occupational
- ☐ C - Clearly Occupational
- ☐ D - Possibly Occupational
- ☑ E - Non-Occupational

4. Faculty Minimum Qualifications/Degrees:

Mathematics

Comments:

SECTION D

General Education Information:

1. College Associate Degree GE Applicability:

Communication & Analytic Thinking

Math Competency

2. CSU GE Applicability:

B-4 Mathematics/Quantitative Reasoning

3. IGETC Applicability:

2: Mathematical Concepts & Quantitative Reasoning

4. CAN :

5. LDTP:

SECTION E

1. Articulation Information: (Required for Transferable Courses Only)

- ☑ CSU Transferable
- ☑ UC Transferable
- ☐ CSU/UC Major Requirement.

If CSU/UC major requirement, list campus and major. (Note: Must be lower division)

2. List at least one community college and its comparable course. If requesting CSU and/or UC transferability also list a CSU/UC campus and comparable lower division course

American River College: MATH 402 Calculus III
CSU Sacramento: MATH 32 Calculus III
UC Davis: MATH 21C Calculus

SECTION F

Planning and Resources: Please address the areas below:

1. Evidence of Need or Potential: recommendations of advisory committee, connection to existing or planned degrees/certificates, or regional/national developments, transfer university requirements.

Required for all math, physics, and engineering majors.

2. Appropriateness to Mission: connection to basic skills, transfer, career technical education, or lifelong learning; relationship

Transfer level math class.

3. Place in Program/Department: relationship to student learning outcomes identified by program, connection to general education, or articulation with other institutions.

Meets GE applicability for Math Competency and Communication and Analytical Thinking. Course includes all four math program SLO's. (Equations and Expressions, Visual Models, Applied Problems, Communication)

4. Availability of Faculty and Facilities: minimum qualifications to teach course, special training for instructors, or long-term physical impact of course.

All math faculty members meet the minimum qualifications to teach this course. No special training would be required.

5. Potential Impact on Resources: impact on library, computer support, transportation, equipment, or other needs

No additional resources are needed since we have the classroom space and technology already available.

SECTION G

1. Maximum Class Size (recommended): 35

2. If recommended class size is not standard, then provide rationale: