# BUTTE COLLEGE
## COURSE OUTLINE

I. **CATALOG DESCRIPTION**

**MATH 32 - Analytic Geometry and Calculus III** **4 Unit(s)**

**Prerequisite(s):** MATH 31
**Recommended Prep:** NONE
**Transfer Status:** CSU/UC
68 hours Lecture

Vector valued functions, calculus of functions of more than one variable, partial derivatives, multiple integration, Green's Theorem, Stokes' Theorem, divergence theorem. (C-ID MATH 230).

II. **OBJECTIVES**

Upon successful 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.

III. **COURSE CONTENT**

A. **Unit Titles/Suggested Time Schedule**

Lecture

| Topics | Hours |
|---|---|
| 1. Vectors and vector operations in two and three dimensions | 5.50 |
| 2. Vector and parametric equations of lines and planes and rectangular equation of a plane | 4.50 |
| 3. Dot, cross, and triple products and projections | 4.00 |
| 4. Differentiability and differentiation including partial derivatives, chain rule, higher-order derivatives, directional derivatives, and the gradient | 7.00 |
| 5. Arc length and curvature; tangent, normal, binormal vectors | 2.00 |
| 6. Vector-valued functions and their derivatives and integrals; finding velocity and acceleration | 4.00 |
| 7. Real-valued functions of several variables, level curves and surfaces | 3.00 |
| 8. Limits, continuity, and properties of limits and continuity | 3.00 |
| 9. Local and global maxima and minima extrema, saddle points, and Lagrange multipliers | 6.00 |
| 10. Vector fields including the gradient vector field and conservative fields | 2.00 |
| 11. Double and triple integrals | 6.00 |

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| 12. Applications of multiple integration such as area, volume, center of mass, or moments of inertia | 6.00 |
| 13. Change of variables theorem | 2.00 |
| 14. Integrals in polar, cylindrical, and spherical coordinates | 3.00 |
| 15. Line and surface integrals including parametrically defined surfaces | 4.00 |
| 16. Integrals of real-valued functions over surface | 2.00 |
| 17. Divergence and curl | 2.00 |
| 18. Green's, Stokes', and divergence theorems | 2.00 |
| Total Hours | 68.00 |

## IV. METHODS OF INSTRUCTION

A. Lecture
B. Collaborative Group Work
C. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
D. Discussion
E. Board Work

## V. METHODS OF EVALUATION

A. Exams/Tests
B. Quizzes
C. Class Assignments and Class Response
D. Daily Homework Assignments, where the student will demonstrate problem-solving skills

## VI. EXAMPLES OF ASSIGNMENTS

A. Reading Assignments
   1. Read the 1959 Reide lecture "The Two Cultures" by C.P. Snow and be prepared to discuss Snow's main thesis in class.
   2. Read any essay from Henry Petroski's "The Essential Engineer" and be prepared to give an account of the essay to other members of your class.

B. Writing Assignments
   1. Write a short paper (2 - 4 pages) discussing C.P. Snow's 1959 Reide lecture "The Two Cultures" and discuss whether or not this lecture is still relevant over 50 years later.
   2. Write a brief paper (1 - 2 pages) on why you decided on your major, what you expect from your college education, and how Math 32 fits into your plan.

C. Out-of-Class Assignments
   1. Find an example of multivariate calculus that is used in your major and be prepared to show it in class.
   2. Interview someone who has a job in your major and be prepared to share how with the class how calculus is applied in this field.

## VII. RECOMMENDED MATERIALS OF INSTRUCTION

Textbooks:

A. Larsen, R.,& Edwards, B.H. Multivariable Calculus. 9th Edition. Brooks/Cole Cengage Learning, 2010.

**Created/Revised by:** Laurie Kincheloe
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