College of San Mateo
Official Course Outline

1. **COURSE ID:** MATH 253 **TITLE:** Calculus with Analytic Geometry III **C-ID:** MATH 230
   Units: 5.0 units **Hours/Semester:** 80.0-90.0 Lecture hours; and 160.0-180.0 Homework hours
   Method of Grading: Letter Grade Only
   Prerequisite: MATH 252
   Recommended Preparation:
   Eligibility for READ 400 or an equivalent level of reading proficiency.

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU; UC
   CSU GE:
   CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING: B4 - Mathematics/Quantitative Reasoning
   IGETC:
   IGETC Area 2: MATHEMATICAL CONCEPTS AND QUANTITATIVE REASONING: A: Math

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   Study of the calculus of functions of several independent variables, partial derivatives, vectors and vector calculus to include Green's theorem, Stokes' theorem, and the divergence theorem.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Perform vector operations.
   2. Determine equations of lines and planes.
   3. Find the limit of a function at a point.
   4. Evaluate derivatives.
   5. Write the equation of a tangent plane at a point.
   6. Determine differentiability.
   7. Find local extrema and test for saddle points.
   8. Solve constraint problems using Lagrange multipliers.
   9. Compute arc length.
   10. Find the divergence and curl of a vector field.
   11. Evaluate two and three dimensional integrals.
   12. Apply Green’s, Stokes’, and divergence theorems.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Perform vector operations.
   2. Determine equations of lines and planes.
   3. Find the limit of a function at a point.
   4. Evaluate derivatives.
   5. Write the equation of a tangent plane at a point.
   6. Determine differentiability.
   7. Find local extrema and test for saddle points.
   8. Solve constraint problems using Lagrange multipliers.
   9. Compute arc length.
   10. Find the divergence and curl of a vector field.
   11. Evaluate two and three dimensional integrals.
   12. Apply Green's, Stokes', and divergence theorems.

6. **COURSE CONTENT:**
   Lecture 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.

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**
Typical methods of instruction may include:
   A. Lecture
   B. Other (Specify): A. Out-of-class assignments: The instructor selects problems and project for students to complete that aid students in meeting the goals of the course. B. Reading assignments: Instructor will assign text readings for discussion of a topic in class. C. Writing assignments: Students may be assigned papers and/or projects more expansive than homework questions (e.g. mathematical modeling). D. Critical thinking: 1. Lectures and class discussion are used to model critical thinking in problem solving. 2. Small groups of students are given challenging problems to solve to encourage critical and innovative approaches to problem solving. 3. Instructors will take steps to encourage students to evaluate proposed problem solutions in the constraints and context of questions posed. E. Resources available on CD and the internet may be used to augment the text.

8. **REPRESENTATIVE ASSIGNMENTS**
Representative assignments in this course may include, but are not limited to the following:
Writing Assignments:
Students may be assigned papers and/or projects more expansive than homework questions (e.g. mathematical modeling).
Reading Assignments:
Instructor will assign text readings for discussion of a topic in class.

9. **REPRESENTATIVE METHODS OF EVALUATION**
Representative methods of evaluation may include:
   A. Class Participation
   B. Class Work
   C. Exams/Tests
   D. Homework
   E. Quizzes
   F. Written examination
   G. A. Written individual assignments and/or journal- to demonstrate individual student progress toward objectives. B. Small group presentations - to demonstrate student participation in problem solving process C. Written exams/quizzes - to reflect student knowledge of vocabulary, concepts, and application of concepts to problem solving as presented in lectures and discussion, small group sessions, and text readings; to include calculation of measures and models, but also interpretation of results in the context of the data being analyzed. D. Directed questions in quizzes and exams as to the meaning of various parts of formulas. E. A comprehensive and cumulative Final Examination - to reflect and demonstrate student knowledge of vocabulary, concepts, and applications of concepts to problem solving as presented in lectures and discussions, small group sessions, and text readings. F. Participation - to reflect student involvement in class discussions, small group sessions and presentations.

10. **REPRESENTATIVE TEXT(S):**
Possible textbooks include:
   A. Stewart, James. *Calculus, Early Transcendentals*, 8th ed. Cengage, 2016

Origination Date: September 2020
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Course Originator: Christopher Walker