COLLEGE OF THE DESERT

Course Code MATH-001A

Course Outline of Record

1. Course Code: MATH-001A
2. a. Long Course Title: Calculus
   b. Short Course Title: CALCULUS
3. a. Catalog Course Description:
   This course is a study of the meaning, computation and analysis of the derivative with an introduction to the integral. Topics include the definitions and analysis of limits, continuity, and differentiability; methods for differentiating polynomial, rational, exponential, logarithmic and trigonometric functions, together with functions represented numerically and graphically; applications of the derivative; and an introduction to the integral.
   b. Class Schedule Course Description:
   This is the first course, Differential Calculus, in the traditional 3 semester Calculus sequence.
   c. Semester Cycle (*if applicable*): Fall, Spring
   d. Name of Approved Program(s):
   - BIOLOGY Associate in Science for Transfer Degree (AS-T)
   - CHEMISTRY Associate in Science for Transfer Degree (AS-T)
   - CHEMISTRY AS Degree and Transfer Preparation
   - ENVIRONMENTAL SCIENCES AS Degree and Transfer Preparation
   - GEOLOGY Associate in Science for Transfer Degree (AS-T)
   - MATHEMATICS AS Degree and Transfer Preparation
   - MATHEMATICS Associate in Science for Transfer Degree (AS-T)
   - PHYSICS Associate in Science for Transfer Degree (AS-T)
4. Total Units: 4.00 Total Semester Hrs: 108.00
   Lecture Units: 3 Semester Lecture Hrs: 54.00
   Lab Units: 1 Semester Lab Hrs: 54.00
   Class Size Maximum: 35 Allow Audit: Yes
   Repeatability No Repeats Allowed
   Justification 0
5. Prerequisite or Corequisite Courses or Advisories:
   Course with requisite(s) and/or advisory is required to complete Content Review Matrix (CCForm1-A)
   Prerequisite: MATH 012
   Advisory: ENG 001A
6. Textbooks, Required Reading or Software: *(List in APA or MLA format.)*
   a. James Stewart (2012). *Calculus, Early Transcendentals* (7th/e). Brooks Cole. ISBN: 0538497904
   College Level: Yes
   Flesch-Kincaid reading level: 12.2
7. Entrance Skills: *Before entering the course students must be able:*
   a.
   Analyze functions and graphs that are described either parametrically, using polar coordinates or using rectangular coordinates. Demonstrate an understanding of the relationship between different coordinate systems.
   - MATH 012 - Analyze functions and graphs that are described either parametrically, using polar coordinates or using rectangular coordinates. Demonstrate an understanding of the relationship between different coordinate systems.

   b.
   Apply the properties of equality to solve equations in one variable involving polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric and absolute value expressions which may involve parameters.

- MATH 012 - Apply the properties of equality to solve equations in one variable involving polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric and absolute value expressions which may involve parameters.

c.

Apply the properties of the real numbers to solve inequalities in one variable involving polynomial, rational, root, exponential, trigonometric and absolute value expressions.

- MATH 012 - Apply the properties of the real numbers to solve inequalities in one variable involving polynomial, rational, root, exponential, trigonometric and absolute value expressions.

d.

Perform arithmetic with the complex numbers and use the complex numbers to completely solve a quadratic equation. Represent complex numbers in both rectangular and polar form and use DeMoivre’s theorem to calculate powers and roots of complex numbers.

- MATH 012 - Perform arithmetic with the complex numbers and use the complex numbers to completely solve a quadratic equation. Represent complex numbers in both rectangular and polar form and use DeMoivre’s theorem to calculate powers and roots of complex numbers.

e.

Analyze polynomial functions in one variable using methods such as end behavior analysis, the factor theorem, the remainder theorem, the theorem on rational zeros, Descartes' rule of signs, the intermediate value theorem, division algorithms, conjugate zeros and the fundamental theorem of algebra.

- MATH 012 - Analyze polynomial functions in one variable using methods such as end behavior analysis, the factor theorem, the remainder theorem, the theorem on rational zeros, Descartes' rule of signs, the intermediate value theorem, division algorithms, conjugate zeros and the fundamental theorem of algebra.

f.

Analyze rational functions in one variable by analyzing the polynomials in the numerator and denominator and interpreting these to find domain, range, intercepts, and asymptotes and visualizing these through the construction of a graph.

- MATH 012 - Analyze rational functions in one variable by analyzing the polynomials in the numerator and denominator and interpreting these to find domain, range, intercepts, and asymptotes and visualizing these through the construction of a graph.

g.

Analyze exponential and logarithmic functions by finding an exponential expression based on essential characteristics such as the growth factor and in terms of domain, concavity, intercepts, asymptotes, transformations, and by visualizing these in the construction of a graph for the function.

- MATH 012 - Analyze exponential and logarithmic functions by finding an exponential expression based on essential characteristics such as the growth factor and in terms of domain, concavity, intercepts, asymptotes, transformations, and by visualizing these in the construction of a graph for the function.

h.

Demonstrate an understanding of a rich variety of trigonometric identities including the pythagorean identities, addition identities, the double angle identities, the half angle identities, sum to product and product to sum identities by proof and through the application of these identities to solve trigonometric equations and simplify trigonometric expressions.

- MATH 012 - Demonstrate an understanding of a rich variety of trigonometric identities including the pythagorean identities, addition identities, the double angle identities, the half angle identities, sum to product and product to sum identities by proof and through the application of these identities to solve trigonometric equations and simplify trigonometric expressions.

i.

Analyze trigonometric and inverse trigonometric functions in terms of their domain, range, asymptotes, and periodicity, and how these relate to chords, secants and arcs on the unit circle. Demonstrate an understanding of these circular functions by constructing graphs and solving equations.

- MATH 012 - Analyze trigonometric and inverse trigonometric functions in terms of their domain, range, asymptotes, and periodicity, and how these relate to chords, secants and arcs on the unit circle. Demonstrate an understanding of these circular functions by constructing graphs and solving equations.

j.
Use Polya's problem solving strategies to solve problems, with an emphasis on the algebraic method with appropriate applications of polynomial, rational, root, exponential, logarithmic, trigonometric and inverse trigonometric expressions.

- MATH 012 - Use Polya's problem solving strategies to solve problems, with an emphasis on the algebraic method with appropriate applications of polynomial, rational, root, exponential, logarithmic, trigonometric and inverse trigonometric expressions.

k.
Communicate mathematics effectively using proper terminology in both verbal and written expressions.

- MATH 012 - Communicate mathematics effectively using proper terminology in both verbal and written expressions.

l.
Apply the properties of equality and the real numbers to solve systems of equations and inequalities. Represent a system of equations using matrix notation and demonstrate an understanding of the arithmetic of matricies.

- MATH 012 - Apply the properties of equality and the real numbers to solve systems of equations and inequalities. Represent a system of equations using matrix notation and demonstrate an understanding of the arithmetic of matricies.

Advisory Skills:

m. Read and comprehend word problems.

- ENG 001A - Find, read, analyze, evaluate, interpret, and synthesize outside sources, including online information.
- ENG 001A - Read, analyze, and interpret varied texts (i.e. literature, digital forms, visual).

8. Course Content and Scope:

Lecture:

1. Definition and computation of limits using numerical, graphical, and algebraic approaches;
2. Continuity and differentiability of functions;
3. Derivative as a limit;
4. Interpretation of the derivative as: slope of tangent line, a rate of change;
5. Differentiation formulas: constants, power rule, product rule, quotient rule and chain rule;
6. Derivatives of transcendental functions such as trigonometric, exponential or logarithmic;
7. Implicit differentiation with applications, and differentiation of inverse functions;
8. Higher-order derivatives;
9. Graphing functions using first and second derivatives, concavity and asymptotes;
10. Maximum and minimum values, and optimization;
11. Mean Value Theorem;
12. Antiderivatives and indefinite integrals;
13. Area under a curve;
14. Definite integral; Riemann sum;
15. Properties of the integral;
16. Fundamental Theorem of Calculus;
17. Integration by substitution; and
18. Indeterminate forms and L'Hopital's Rule.

Lab: *(if the "Lab Hours" is greater than zero this is required)*

1. Applications of topics discussed in lecture using appropriate mathematical tools, including technology.

9. Course Student Learning Outcomes:

1.
Evaluate the limit of a function using the concept that it is the behavior of a function when the input variable gets arbitrarily close to a certain value or its magnitude becomes arbitrarily small or arbitrarily large.

2.
Find the derivative of a function using a variety of methods, including the definition as a limit.

3.
Use the concept of derivative and fluency in skills from arithmetic, algebra, geometry, analytic geometry, and trigonometry to model and solve application problems that involve rates of change.

4.
Demonstrate critical and logical thinking, by frequent use of deductive reasoning in mathematics, in the context of differential calculus.

10. Course Objectives: *Upon completion of this course, students will be able to:*

a. Compute the limit of a function at a real number;
b. Determine if a function is continuous at a real number;
c. Construct the derivative of a function as a limit;
d. Construct the equation of a tangent line to a function;
e. Compute derivatives using differentiation formulas;
f. Use differentiation to solve applications such as related rate problems and optimization problems;
g. Use implicit differentiation;
h. Graph functions using methods of calculus;
i. Evaluate a definite integral as a limit;
j. Evaluate integrals using the Fundamental Theorem of Calculus; and
k. Apply integration to find area.

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*

a. Discussion
b. Laboratory
c. Lecture
d. Technology-based instruction

12. Assignments: *(List samples of specific activities/assignments students are expected to complete both in and outside of class.)*

In Class Hours: 108.00
Outside Class Hours: 108.00

a. In-class Assignments

Attend classroom lectures and take notes.
1. Participate in classroom discussions to review, analyze, diagnose, and evaluate various methods of solution used in homework assignments.
2. Complete laboratory assignments using appropriate mathematical tools.
3. Complete examinations involving problems that apply studied principles to new situations.

b. Out-of-class Assignments

Read textbooks and supplementary assignments.

Complete assigned homework including problem solving, exercises to improve skills and mathematical understanding.
Complete examinations involving problems that apply studied principles to new situations.

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*
    - College level or pre-collegiate essays
    - Written homework
    - Guided/unguided journals
    - Portfolios
    - Term or research papers
    - Reading reports
    - Laboratory projects
    - Computational/problem solving evaluations
    - Presentations/student demonstration observations
    - Group activity participation/observation
    - Product/project development evaluation
    - Self/peer assessment and portfolio evaluation
    - True/false/multiple choice examinations
    - Mid-term and final evaluations
    - Student preparation
    - Oral and practical examination

14. Methods of Evaluating: Additional Assessment Information:

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*
    IGETC Area 2: Mathematical Concepts and Quantitative Reasoning
    A: Mathematic
    CSU GE Area B: Physical and its Life Forms(mark all that apply)
    B4 - Mathematics/Quantitative Thinking
    PO-GE C4.b - Language & Rationality (Communication & Analytical Thinking)
    Gather, assess, and interpret relevant information.
    Apply logical and critical thinking to solve problems; explain conclusions; and evaluate, support, or critique the thinking of others.
    IO - Scientific Inquiry
    Analyze quantitative and qualitative information to make decisions, judgments, and pose questions.
    IO - Global Citizenship - Scientific & Technological Literacy
    Utilize quantitative expression in a variety of contexts. These would include units of measurement, visual representations, and scales and distributions.
    Synthesize, interpret, and infer, utilizing information, data, and experience to solve problems, innovate, and explore solutions.

16. Comparable Transfer Course

University System	Campus	Course Number	Course Title	Catalog Year
UC	UC Berkeley	1A	Math 1A - Calculus	2011

17. Special Materials and/or Equipment Required of Students:
    Graphing and programmable calculator

18. Materials Fees: ☐ Required Material?

Material or Item	Cost Per Unit	Total Cost

19. Provide Reasons for the Substantial Modifications or New Course:

    SLO update

20. a. Cross-Listed Course *(Enter Course Code)*: *N/A*
    b. Replacement Course *(Enter original Course Code)*: *N/A*

21. Grading Method *(choose one)*: Letter Grade Only

22. MIS Course Data Elements
    a. Course Control Number [CB00]: CCC000568551
    b. T.O.P. Code [CB03]: 170100.00 - Mathematics, General
    c. Credit Status [CB04]: D - Credit - Degree Applicable
    d. Course Transfer Status [CB05]: A = Transfer to UC, CSU
    e. Basic Skills Status [CB08]: 2N = Not basic skills course
    f. Vocational Status [CB09]: Not Occupational
    g. Course Classification [CB11]: Y - Credit Course
    h. Special Class Status [CB13]: N - Not Special
    i. Course CAN Code [CB14]: *N/A*
    j. Course Prior to College Level [CB21]: Y = Not Applicable
    k. Course Noncredit Category [CB22]: Y - Not Applicable
    l. Funding Agency Category [CB23]: Y = Not Applicable
    m. Program Status [CB24]: 1 = Program Applicable

    Name of Approved Program *(if program-applicable)*: BIOLOGY,CHEMISTRY,CHEMISTRY,ENVIRONMENTAL SCIENCES,GEOLOGY,MATHEMATICS,MATHEMATICS,PHYSICS

    Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)

23. Enrollment - Estimate Enrollment
    First Year: 0
    Third Year: 0

24. Resources - Faculty - Discipline and Other Qualifications:
    a. Sufficient Faculty Resources: Yes
    b. If No, list number of FTE needed to offer this course: *N/A*

25. Additional Equipment and/or Supplies Needed and Source of Funding.

    N/A

26. Additional Construction or Modification of Existing Classroom Space Needed. *(Explain:)*

    N/A

27. FOR NEW OR SUBSTANTIALLY MODIFIED COURSES
    Library and/or Learning Resources Present in the Collection are Sufficient to Meet the Need of the Students Enrolled in the Course: Yes

28. Originator Melissa, S Flora Origination Date 10/10/17