MATH 0030 - ANALYTICAL GEOMETRY AND CALCULUS I

SECTION A

1. Division: Sciences & Mathematics
2. Subject Code: MATH
3. Course Number: 0030
4. Course Title: ANALYTICAL GEOMETRY AND CALCULUS I
5. Semester of First Offering: FALL 2015

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 8 and either MATH 12 or 29 with grades of "C" or better, or placement by matriculation assessment process

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:

Introduction to differential and integral calculus. Content includes limits, continuity, differentiation and integration of algebraic, trigonometric, exponential, logarithmic, hyperbolic and other transcendental functions; as well as application problems.

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 the limit of a function at a real number;
2. Determine if a function is continuous at a real number;
3. Find the derivative of a function as a limit;
4. Find the equation of a tangent line to a function;
5. Compute derivatives using differentiation formulas;
6. Use differentiation to solve applications such as related rate problems and optimization problems;
7. Use implicit differentiation;
8. Graph functions using methods of calculus;
9. Evaluate a definite integral as a limit

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.)

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, hyperbolic, 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;
18. Indeterminate forms and L'Hopital's Rule

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.)

Read in your textbook how the first and second derivative of a function influence the graph of the function.

Research online the history of the development of calculus, including Newton and Leibniz.

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

1. Write a report on the historical and mathematical origins of l'Hospital's rule.

2. After reading about Newton's and Leibniz's development of calculus, write a 3 - 5 paragraph essay comparing and contrasting each approach.

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 & Lyle Cochran
Title:	Calculus for Scientists and Engineers: Early Transcendentals
Publisher:	Addison-Wesley
Date of Publication:	2014
Edition:	2nd

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- Interactive lecture format to develop the concept of what a derivative represents, given a variety of functions (e.g., rational, polynomial, trigonometric, exponential, logarithmic). To help students see the commonalities and differences between the derivatives of each type of function, the instructor will incorporate algebraic analysis through equations and visual analysis through graphing. Students will participate verbally and will work several examples.

Example 2- In class, small group collaborative learning activities will focus on applied physics problems involving derivatives. These will include analysis of velocity, acceleration, and other instantaneous rates of change. Students will practice reading problems, interpreting problems, and developing solutions with peers.

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.)

1. A particle moves on a vertical line so that its coordinate at time t is y = t^3 - 12t + 3, for t > 0. Find the velocity and acceleration functions. When is the particle moving upwards and when is it moving downwards? Find the distance the particle moves in the time interval t = 1 to t = 3. This problem is graded for correct method and accuracy.

2. Find an equation of the line through the point (3, 5) that cuts off the least area from the first quadrant. This problem is graded for method and accuracy.

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
Physical Sciences

2. CSU GE Applicability:

B-4 Mathematics/Quantitative Reasoning

3. IGETC Applicability:

2: Mathematical Concepts & Quantitative Reasoning

4. CAN : MATH 210 Single Variable Calculus I Early Transcendentals; and, with MATH 31, MATH 900S Single Variable Calculus Sequence

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 400 Calculus I
CSU Sacramento: MATH 30 Calculus I
UC Davis: MATH 21A 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.
Transfer-level math class.
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)

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

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

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

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

SECTION G

1. Maximum Class Size (recommended): 35

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