CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Mathematics C2210 – Calculus I: Early Transcendentals

5 hours lecture, 5 units

Catalog Description
A first course in differential and integral calculus of a single variable. Topics include limits and continuity of functions, techniques and applications of differentiation, an introduction to integration, and the Fundamental Theorem of Calculus. This course is primarily intended for Science, Technology, Engineering, and Mathematics (STEM) majors.

Formerly MATH 180. Not open to students with credit in MATH 180.

Prerequisite
Pre-calculus, or college algebra and trigonometry, or equivalent, or placement as determined by the college's multiple measures assessment process.

Entrance Skills
Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:
1) Algebra: domain and range, solving equations involving polynomials, rational functions, logarithms, exponents, radicals, and absolute values.
2) Trigonometric identities and formulas; standard angles; converting between radians and degrees; solving trigonometric equations.
3) Analytic geometry; formulas for standard geometric objects; properties of geometric figures; similarity
4) Mathematical modeling and recognizing mathematical arguments.
5) Graphing functions and their inverses; and interpreting graphs.

Course Content
Part 1:
1) Limits: intuitive and precise definitions; computation using numerical, graphical, and algebraic approaches
2) Continuity and differentiability of functions
3) Derivative as a limit
4) Interpretation of derivatives as slopes of tangent lines and rates of change
5) Differentiation formulas: constants, power rule, product rule, quotient rule, and chain rule
6) Derivatives of transcendental functions including trigonometric, exponential, and logarithmic
7) Implicit differentiation, differentiation of inverse functions, including inverse trigonometric functions
8) Applications of differentiation, including related rates and optimization
9) Higher-order derivatives
10) Indeterminate forms and L'Hôpital's Rule
11) Maximum and minimum values, Extreme Value Theorem
12) Graphing functions using first and second derivatives, concavity, and asymptotes
13) Mean Value Theorem
14) Antiderivatives and indefinite integrals
15) Definite integrals as limits of Riemann sums
16) Interpretation of the integral as area under a curve and net change

17) Basic integration rules and properties of integrals
18) Fundamental Theorem of Calculus
19) Integration by substitution

Course Objectives
Part 1:
1) At the conclusion of this course, the student should be able to: Compute the limit of a function and evaluate indeterminate forms using L'Hôpital's Rule.
2) Determine the continuity of a function.
3) Find the derivative of a function as a limit.
4) Find the equation of a tangent line to the graph of 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 and find derivatives of transcendental functions.
8) Graph functions using methods of calculus.
9) Evaluate a definite integral as a limit.
10) Evaluate integrals using the Fundamental Theorem of Calculus.
11) Apply integration to find areas.

Method of Evaluation
Part 1:
Students should demonstrate their mastery of the learning objectives and their ability to devise, organize, and present complete solutions to problems.

Examples of potential methods of evaluation include, but are not limited to, exams, quizzes, homework, classwork, technology-based activities, laboratory work, projects, and research demonstrations.

Methods of evaluation are at the discretion of local faculty

Special Materials Required of Student
Graphing utility, portfolio

Minimum Instructional Facilities
Smart classroom with whiteboards covering three walls, graphing utility overhead viewing panels, projection screen

Method of Instruction
1) Lecture and discussion
2) Teamwork

Out-of-Class Assignments
1) **Reading:** Lecture notes; assigned sections from the textbook; supplemental problem explanations; online graphing tool documentation (e.g. Desmos help pages, CAS tool guides); instructor-provided conceptual summaries and study guides. Students may also read articles or excerpts demonstrating real-world applications of calculus in physics, engineering, economics, and biology.
2) **Writing/Problem Solving:** Problem sets requiring students to show full mathematical reasoning using proper notation and explanation; written justifications of limit calculations using limit laws or the definition of derivative; error analysis and reflection on incorrect solutions; explanation of problem-solving strategies in multi-step applications; written solutions to group problem assignments; step-by-step documentation of computational methods used with technology (e.g. graphing calculators or computer algebra systems).
3) **Other:** Online homework using learning platforms (e.g. MyMathLab, WebAssign, or MyOpenMath); collaborative study activities using shared documents; constructing graphs by hand and with

technology; reviewing and annotating instructor feedback to revise and improve solutions; exam preparation activities including practice tests and concept reviews; application-based projects modeling real-world data using derivatives and integrals; use of math software to explore numerical approximation methods.

Representative Texts, Manuals, OER, and Other Support Materials
A college level textbook designed for science, technology, engineering and math majors, and supporting the learning objectives of this course.

Representative texts:

- Strang, G., Herman, E., et al. (2016 & Web 2025). Calculus Volume 1. OER: OpenStax.
- https://openstax.org/details/books/calculus-volume-1/
- Stewart, J., et al. (2021). Calculus: Single Variable Calculus Early Transcendentals. 9th ed.: Cengage.
- Briggs, W., et al. (2019). Calculus: Early Transcendentals. 3rd ed.: Pearson.
- Hass, J., et al. (2023). Thomas' Calculus: Early Transcendentals. 15th ed.: Pearson.

Texts used by individual institutions and even individual sections will vary.

Exit Skills
Students having successfully completed this course exit with the following skills, competencies and/or knowledge:

1) Essential vocabulary and concepts of limits, continuity, differentiation, and integration.
2) Evaluating limits: algebraic, trigonometric, logarithmic and exponential functions
3) Limit Calculations using L'Hôpital's Rule and indeterminate forms.
4) Evaluating derivatives involving algebraic, trigonometric, logarithmic, exponential and inverse functions.
5) Implicit differentiation
6) Evaluating integrals: algebraic, trigonometric, logarithmic and exponential functions
7) Applying the Fundamental Theorem of Calculus.
8) Graphing: interpreting function behavior from derivatives
9) Modeling and applications such as related rates and relative extrema.

Student Learning Outcomes
Upon successful completion of this course, students will be able to:

1) Use analytical, numerical, or graphical methods to evaluate or interpret limits, derivatives, and integrals.
2) Apply differentiation or integration to solve interdisciplinary application problems and interpret the results in context.