Curriculum Committee Approval: 12/02/2025
Lecture Contact Hours: 64-72; Outside-of-Class Hours: 128-144; Total Student Learning Hours: 192-216

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Mathematics C2220 – Calculus II: Early Transcendentals

4 hours lecture, 4 units

Catalog Description
A second course in differential and integral calculus of a single variable. Topics include applications of integration, techniques of integration, infinite sequences and series, and the calculus of parametric and polar equations. This course is primarily intended for Science, Technology, Engineering, and Mathematics (STEM) majors.

Formerly MATH 280. Not open to students with credit in MATH 280.

Prerequisite
Calculus I: Early Transcendentals (MATH C2210), 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) Essential vocabulary and concepts of limits, continuity, differentiation, and integration
2) Evaluating limits: Algebraic, trigonometric, logarithmic and exponential functions
3) Limit Calculations using L'Hopital'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) Graphing families of curves and interpreting function behavior from derivatives.
8) Modeling and Applications such as related rates and relative extrema

Course Content
Part 1:
1) Applications of integration to areas between curves and volumes, including volumes of solids of revolution
2) Techniques of integration, including integration by parts, trigonometric substitution, and partial fraction decomposition
3) Numerical integration, including trapezoidal and Simpson's rules
4) Improper integrals
5) Additional applications of integration, such as work, arc length, area of a surface of revolution, moments and centers of mass, separable differential equations, growth and decay
6) Introduction to sequences and series
7) Multiple tests for convergence of sequences and series
8) Power series, radius of convergence, interval of convergence
9) Differentiation and integration of power series
10) Taylor series expansion of functions
11) Parametric equations and calculus with parametric curves
12) Polar curves and calculus in polar coordinates

Part 2:
1) Conic sections

Course Objectives
At the conclusion of this course, the student should be able to:
Part 1:
1) Apply integration to find areas and volumes.
2) Evaluate definite and indefinite integrals using a variety of integration formulas and techniques.
3) Use integration to solve applications such as work or length of a curve.
4) Evaluate improper integrals.
5) Determine convergence of sequences and series.
6) Represent functions as power series.
7) Graph, differentiate, and integrate functions in polar and parametric form.

Part 2:
1) Analyze and graph general conic sections.

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.
Part 2:
A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.
1) Quizzes which measure the student’s ability to: apply numerical methods of integration including midpoint, trapezoidal and Simpson’s rule to evaluate both proper and improper integrals; use the Mean Value Theorem and L’Hôpital’s Rule to evaluate integrals and solve problems; use Geometric series to solve application problems.
2) Exams which measure the student’s ability to: use various techniques of integration to evaluate the antiderivative of a single-variable function; use integrals to represent a quantity of interest by first examining a finite sum approximation of the quantity and then extrapolating to the limit; convert between polar and rectangular coordinates and use the area formula in polar coordinates; identify, manipulate and graph the standard and general forms of the conic sections including translations and rotations.
3) Individual projects which measure the student’s ability to: apply Taylor and Fourier series as approximations of functions; select and apply appropriate technology to model, analyze and interpret a collection of data or to solve real-world application problems requiring the use of analytic geometry and calculus.
4) Group-work, class activities, homework, and/or quizzes which measure the student’s ability to select and apply appropriate technology including but not limited to computer programs and graphing utilities to model, analyze and interpret a collection of data or to solve real-world application problems requiring the use of analytic geometry and calculus.

Special Materials Required of Student
Graphing utility, portfolio

Minimum Instructional Facilities
Smart classroom with writing boards 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.

Texts and References
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 2. OER: OpenStax. https://openstax.org/details/books/calculus-volume-2/
- 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) Modeling and Applications, including surface area and volume of revolution
2) Identify and apply appropriate integration techniques: integration by parts; trigonometric substitution; trigonometric power reduction methods; and improper integrals.
3) Characterizing special types of sequences and series; Determining limits of sequences; Calculating terms, partial sums and sums of infinite series; Using various tests on series to determine convergence; and Using Maclaurin and Taylor series to approximate functions.
4) Graphing and Analytic Geometry using parametric equations and polar coordinates.

Student Learning Outcomes

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

1) Use analytical, numerical, and graphical methods to solve calculus problems related to real-valued functions, polar & parametric equations, and power series.
2) Solve multi-disciplinary application problems and interpret the results in context