Course Outline Report

MATH C2210 - Calculus I: Early Transcendentals

Discipline: Mathematics

Department: Mathematics

Term Effective: Fall 2026

Requisites

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

Entrance Skill

A. Requisite Skills:
None

B. Recommended Skills:
None

Units and Hours

Semester Units: 4.000

Semester Hours:

Instructional Categories	Units	Contact Hours	Out of Class Hours
Lecture	4	64 - 72	128 - 144
Independent Study	0	0	0
Lab/Field	0	0	0
Activity	0	0	0
Total	4	64 - 72	128 - 144
Total Student Learning Hours	192 - 216		

Recommended Course Enrollment: 40

Need for the Course

1. MATH C2210 is the first of a series of three calculus courses, required for degrees in mathematics and many of the sciences.
2. MATH C2210 satisfies the associate degree general education requirement for computation and analytical thinking.
3. MATH C2210 satisfies the CalGETC requirement for mathematical concepts and quantitative reasoning and the CSU general education requirement for mathematics.
4. MATH C2210 is transferable to both CSU and UC.

Goals for the Course

1. To fulfill part of the mission of a two-year college by offering mathematical content expected of science majors.
2. To prepare students for further studies in mathematics.

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.

Schedule 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.

Student Learning Outcomes:

Upon satisfactory completion of the course, students will be able to:

1. Evaluate limits, including proofs, for linear functions.
2. Determine and analyze derivatives as appropriate to first year calculus.
3. Recognize, define, and use formal mathematical notation as appropriate to the course outline.

Course Objectives

Upon satisfactory completion of the course, students will be able to:

1. 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.

Course Content

Lecture Outline
COMMON COURSE NUMBERING CONTENT

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. Anti-derivatives 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

Representative Texts and Instructional Materials

Textbooks: Calculus: Single Variable Calculus Early Transcendentals, Stewart, J., et al., Cengage, 2021
Thomas' Calculus: Early Transcendentals, Hass, J., et al., Pearson, 2023
Calculus: Early Transcendentals, Briggs, W., et al., Pearson, 2019
Calculus Volume 1. OER: OpenStax, Strang, G., Herman, E., et al., OpenStax (2016 & Web 2025), 2025
Other: Videos that cover the topics of this course are available through many online web sites such as Khan Academy and through MyMathLab.
Strang, G., Herman, E., et al. (2016 & Web 2025). Calculus Volume 1. OER: OpenStax. : https://openstax.org/details/books/calculus-volume-1/

Methods of Instruction

- **Audio Visual Presentations**

Audio-visual resources enhance understanding by providing visual and auditory context. This can involve using: -Animations or videos to visualize concepts like the area under a curve (integration) or the instantaneous rate of change (derivative). -Computer software projections to display dynamic graphing (e.g., changing parameters to see the effect on a function's graph). Addressing this Method of Instruction in DEIA: Diversity: Use content featuring diverse cultures, genders, and perspectives. Include examples and case studies from various regions and contexts. Equitability: Provide equal access to audio-visual materials, ensuring all students have the necessary technology to view them. Inclusiveness: Ensure content is culturally sensitive and free from bias. Use inclusive language and examples that resonate with a wide audience. Accessibility: Use captions and transcripts for videos, and ensure that visual content is described for students with visual impairments.

- **Class Activities**

  Class activities are structured tasks designed to reinforce learning and practice skills. Examples include: -Short in-class quizzes to check comprehension of the previous lecture. -Think-Pair-Share where students individually solve a minor problem before discussing it with a partner and then the class. -Whiteboard practice where students work problems out on a shared surface. Addressing this Method of Instruction in DEIA: Diversity: Design activities that draw on diverse cultural contexts and perspectives. Include tasks that allow students to share their unique viewpoints. Equitability: Ensure all students have equal opportunities to engage in activities. Provide necessary materials and support for all. Inclusiveness: Create activities that cater to different learning styles and abilities. Ensure everyone can participate and contribute. Accessibility: Adapt activities to be inclusive of students with disabilities. Provide alternative formats and ensure physical accessibility.

- **Class Discussions**

  Class discussions encourage critical thinking and deeper conceptual understanding. The instructor can pose open-ended questions like: -"Why must a function be continuous for the Intermediate Value Theorem to apply?" -"How does the concept of a limit allow us to define the derivative?" -"What are the practical applications of the second derivative (concavity) in real-world scenarios?" Addressing this Method of Instruction in DEIA: Diversity: Encourage sharing of diverse perspectives and experiences. Facilitate discussions on topics that highlight different cultural viewpoints. Equitability: Structure discussions to allow equal participation. Use strategies like talking sticks or timed turns. Inclusiveness: Ensure all voices are heard and respected. Create a safe space for open dialogue. Accessibility: Provide accommodations such as sign language interpreters or speech-to-text services. Ensure discussion spaces are accessible.

- **Collaborative Group Work**

  Collaborative group work requires students to actively construct knowledge by working together. Groups might be assigned: -Challenging application problems that require synthesis of multiple concepts. -Error analysis tasks where they find and correct mistakes in a worked-out problem. -Mini-projects such as deriving the area formula for a non-standard shape using integration. Addressing this Method of Instruction in DEIA: Diversity: Form groups with diverse members to bring various perspectives and skills to the table. Equitability: Assign roles and tasks equitably within groups to ensure balanced participation. Inclusiveness: Encourage inclusive group dynamics where each member’s contribution is valued. Accessibility: Ensure that group work spaces and communication methods are accessible to all students.

- **Computer-aided Instruction**

  Computer-aided Instruction utilizes technology for practice and interactive learning. Students can use: -Online homework systems for immediate feedback on practice problems. -Calculus software (like WolframAlpha, Maple, or GeoGebra) for symbolic differentiation/integration to check their manual work, explore functions graphically, or run simulations (e.g., numerical methods). Addressing this Method of Instruction in DEIA: Diversity: Use software and resources that reflect a wide range of cultural and contextual examples. Equitability: Ensure all students have access to the necessary technology and support. Inclusiveness: Select programs that cater to different learning styles and abilities. Accessibility: Choose software that is compatible with assistive technologies and follows accessibility standards.

- **Demonstration**

  Demonstration involves the instructor showing students how to perform a task. In calculus, this means working out complex example problems on the board or screen, illustrating geometric interpretations (e.g., using secant lines to approach a tangent line), or showing the algebraic manipulation required to simplify expressions before differentiation or integration. Addressing this Method of Instruction in DEIA: Diversity: Include examples from diverse cultures and contexts. Demonstrate skills and concepts that are universally applicable. Equitability: Ensure all students have the opportunity to observe and ask questions during demonstrations. Inclusiveness: Use clear, inclusive language and ensure demonstrations are understandable to all students. Accessibility: Provide demonstrations in multiple formats (e.g., live, video) and ensure physical accessibility of the demonstration area.

- **Directed Study**

  Students work independently on assigned tasks or projects, guided by the instructor. This method encourages self-discipline and independent learning. Addressing this Method of Instruction in DEIA: Diversity: Allow students to choose study topics that reflect their cultural backgrounds and interests. Equitability: Offer guidance and support to all students equally, ensuring they have the resources they need. Inclusiveness: Provide diverse resources and materials to support independent learning. Accessibility: Ensure study materials are available in accessible formats and provide accommodations as needed.

- **Feedback and Critique**

  Feedback and critique are crucial for correcting misconceptions and improving problem-solving rigor. This involves: -Detailed grading on quizzes and exams, focusing not just on the answer but on the methodology and notation. -Peer review of solutions to highlight different approaches and common errors. -Individual consultation to discuss a student's particular area of weakness (e.g., algebraic simplification, trigonometric substitution). Addressing this Method of Instruction in DEIA: Diversity: Provide feedback that is respectful of cultural differences and sensitive to diverse perspectives. Equitability: Give equal attention and support to all students in providing feedback. Inclusiveness: Ensure feedback is constructive and encourages growth for all students. Accessibility: Deliver feedback in accessible formats, such as written, audio, or video, and ensure students understand it.

- **Guest Speakers**

  Professionals are brought in to share their career experiences, giving students firsthand insights into the practical application of calculus concepts like optimization, modeling, and rates of change. These talks serve to enrich the curriculum and offer crucial motivation by illustrating the professional

relevance of the material. Potential speakers include: -An engineer discussing how derivatives are used for optimization (e.g., minimizing cost or maximizing strength). -A financial analyst explaining continuous compounding or rates of change in economic models. Addressing this Method of Instruction in DEIA: Diversity: Invite speakers from diverse backgrounds and fields to provide a range of perspectives. Equitability: Provide equal opportunity for all students to engage with guest speakers, including Q&A sessions. Inclusiveness: Ensure topics discussed are relevant and inclusive of all students' interests and backgrounds. Accessibility: Ensure presentations are accessible, with accommodations such as captions or interpreters if needed.

- **Lecture**

  The lecture method is essential for introducing new concepts, theories, and fundamental techniques. In calculus, this includes explaining definitions (e.g., limits, derivatives, integrals), deriving theorems (e.g., Mean Value Theorem, Fundamental Theorem of Calculus), and demonstrating step-by-step problem-solving methods. Addressing this Method of Instruction in DEIA: Diversity: Include content from diverse cultures and perspectives in lectures. Equitability: Ensure all students have equal opportunities to engage with the lecture content. Inclusiveness: Use inclusive language and examples that are relevant to all students. Accessibility: Provide lecture materials in accessible formats and ensure lecture halls are accessible.

- **Observation**

  Students learn by watching others, such as instructors, peers, or professionals in action. This method helps students understand processes and techniques through visual learning. This is particularly valuable during group work or in-class activities to: -Gauge student understanding in real-time. -Identify common errors or points of confusion across the class. -Provide immediate, targeted scaffolding or redirection to groups that are struggling. Addressing this Method of Instruction in DEIA: Diversity: Observe a range of examples that reflect diverse practices and contexts. Equitability: Provide equal opportunities for all students to participate in observation activities. Inclusiveness: Ensure observation activities are inclusive of all students' backgrounds and experiences. Accessibility: Ensure observation spaces and materials are accessible to all students, providing accommodations as needed.

Emergency Remote Instruction Yes

In emergency circumstances that require campus closure, remote instruction may be incorporated. Courses offered remotely will achieve or adapt stated learning outcomes for the remote environment. Instruction will maintain regular effective contact through conferencing and LMS applications. Instructional materials will be adapted to meet ADA compliance. Instructors will be supported through available campus resources including Alternative Media and Assistive Technology Specialist, DSPS Office, PD Lead, DE Lead, and other available resources to help ensure that instructional materials are accessible to persons with disabilities.

Assignments and Methods of Evaluation

Reading Assignments

Students will be expected to read assigned textbook sections on topics such as limits, continuity, differentiation, Fundamental Theorem of Calculus, and integration prior to class meetings. Readings emphasize conceptual understanding, notation, and interpretation of mathematical definitions and theorems. In addition to textbook materials, students are assigned articles to review on applications of calculus, pedagogy, study methods, or the history of mathematics.

Questions accompanying these readings require students to analyze, critique, and synthesize ideas across multiple sources.

Other Assignments

Students will complete problem sets and written analyses that apply calculus concepts to both theoretical and real-world problems, requiring independent inquiry and justification of reasoning. Assignments include evaluating limits, finding derivatives and integrals using appropriate rules, analyzing and modeling data, and interpreting results within applied contexts. Within these assignments, students will provide formal written explanations, construct organized solutions which may be supported by appropriate technology, justify the methods used, interpret results in applied contexts, and engage in reflective analysis of their problem-solving strategies.

Out-of-class assignments may also include written reflections on problem-solving approaches; technology-based explorations using graphing tools or computer algebra systems; preparation, revision, and submission of project drafts; written reflections based on peer and instructor feedback; and class discussions boards connecting calculus concepts to applications, pedagogy, and historical development.

1. PART 1
    a. Other: 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. (1-1%)
        - **Comment:** 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.
2. PART 2
    a. Class Participation (1-1%)
        - **Comment:** Description: Students are evaluated on their engagement during class activities. Example: Contributing to problem-solving discussions, asking questions, and participating in group activities on topics like limits and derivatives. Addressing DEIA in this Evaluation Method: Diverse: Participation activities are designed to encourage diverse voices and perspectives in class discussions and collaborative projects, fostering an inclusive learning environment where all students feel valued. Equitable: Assessment of participation is based on fair and consistent criteria, taking into account various forms of participation, including verbal and written contributions, group collaboration, and online interactions, with accommodations available for students with diverse needs. Inclusive: Instructors create an inclusive classroom culture that respects and welcomes input from all students, ensuring that everyone has the opportunity to contribute to discussions and activities. Accessible: Participation opportunities are

made accessible to all students, with flexible participation options, clear guidelines for engagement, and support available for those who may require accommodations to participate fully in class activities, discussions, or online platforms.

b. Homework (1-1%)
   - **Comment:** Description: Regular assignments are given to students to complete outside of class. Example: Weekly problem sets that include exercises on finding limits, derivatives, and solving related rates problems. Students will be required to show their work so that they will grow in their ability to use and understand proper mathematical notation. Addressing DEIA in this Evaluation Method: Diverse: Homework assignments offer a variety of problems that appeal to different learning styles and abilities, fostering a diverse learning environment. Equitable: Grading criteria for homework are transparent and applied consistently to provide an equitable assessment of students' efforts. Inclusive: Homework deadlines and submission methods are flexible to accommodate students with diverse schedules and responsibilities. Accessible: Homework assignments are accessible to all students, with clear instructions and resources available for those who may need extra support.

c. Quizzes (1-1%)
   - **Comment:** Description: Short, frequent formative assessments to gauge understanding of recent material. Example: Quizzes on the definition and computation of limits, derivative rules, and the chain rule. Addressing DEIA in this Evaluation Method: Diverse: Low-stakes quizzes cover a wide range of topics, offering students multiple opportunities to showcase their understanding of various aspects of the course material. Equitable: Accommodations are readily available for students with diverse learning needs, such as extended time or alternate quiz formats, ensuring a level playing field for all. Inclusive: Quiz questions are carefully crafted to be inclusive, avoiding cultural biases or any language that might disadvantage certain groups of students. Accessible: Quiz formats and platforms are chosen with accessibility in mind, and clear instructions are provided to make the quizzes as accessible as possible to all students, including those with disabilities.

d. Examinations (1-1%)
   - **Comment:** Description: At least three summative examinations must be given, one of which must be a comprehensive final exam. Not all examinations may be assigned as take-home. Alternative Assessment Policy: Project-based assessments or other forms of alternative evaluations may be used as summative measures in place of traditional written examinations. Example: Examinations should cover major topics such as differentiation techniques and applications of derivatives Addressing DEIA in this Evaluation Method: Diverse: Test questions and problems are designed to encompass a wide range of scenarios, ensuring that students from various backgrounds and experiences have the opportunity to excel. Equitable: Grading criteria are consistently applied, and adjustments are made to address potential biases, promoting fairness for all students. Inclusive: Accommodations are provided for students with diverse learning needs, such as extended time or alternative testing formats, ensuring an equitable evaluation process. Accessible: Test formats are designed with accessibility features, such as clear instructions and accessible technology, to ensure all students can participate on an equal footing.

e. Presentations (oral or visual) (1-1%)
    - **Comment:** Description: Students present their understanding of a topic orally or using visual aids. Example: Presenting the concept and application of the Mean Value Theorem using graphs and examples. Addressing DEIA in this Evaluation Method: Diverse: Presentation topics are chosen to be inclusive and encompass a wide range of subjects, allowing students to select content that reflects their diverse interests and perspectives. Equitable: Clear presentation evaluation criteria are communicated in advance, and grading is consistently applied, ensuring an equitable assessment process. Inclusive: In group presentations, inclusive communication and collaboration are encouraged to ensure all group members can participate effectively and share their perspectives. Accessible: Presentation materials and formats are designed to be accessible to all students, including those with disabilities, and accommodations are readily available for students who may require additional support in delivering their presentations
f. Projects (1-1%)
    - **Comment:** Description: Larger, often collaborative tasks that integrate multiple course concepts. Example: A project on optimizing real-world scenarios using calculus, such as maximizing the volume of a box with given constraints. Addressing DEIA in this Evaluation Method: Diverse: Project topics are designed to be inclusive, allowing students to choose subjects that reflect their unique interests, backgrounds, and perspectives, fostering a diverse range of project ideas. Equitable: Clear rubrics and assessment criteria are provided to all students, offering a transparent and equitable grading process, while adjustments are made to address any potential biases in project evaluation. Inclusive: Group projects encourage collaboration among students from diverse backgrounds to ensure a variety of experiences and insights contribute to the final project. Accessible: Project guidelines are designed to be accessible to all students, with instructors offering support and accommodations to address specific accessibility needs, ensuring that all students can participate fully in the project process.
g. Portfolios (1-1%)
    - **Comment:** Description: A collection of a student's work over time, showcasing their learning progression. Example: A portfolio including homework, quizzes, and reflective summaries on topics like integration and its applications. Addressing DEIA in this Evaluation Method: Diverse: Portfolios allow students to curate a collection of their work, providing an opportunity to showcase their diverse talents, perspectives, and achievements throughout the course. Equitable: Grading criteria for portfolios are transparent, consistent, and designed to assess the quality and depth of students' work fairly. Adjustments are made to address potential biases in portfolio assessment. Inclusive: Portfolio assessment encourages students to select a variety of assignments and projects that resonate with their individual learning styles, ensuring inclusivity and recognition of their unique strengths. Accessible: Portfolio submission platforms are chosen to be accessible, and guidelines are provided to create accessible digital portfolios. Accommodations are available to support students with diverse needs in the portfolio creation process, ensuring an accessible evaluation process for all students.
h. Written Papers or Reports (1-1%)

- **Comment:** Description: Extended written work on specific topics. Example: A report on the historical development of calculus and its impact on modern science and engineering. Addressing DEIA in this Evaluation Method: Diverse: Written Papers and Reports incorporate diverse perspectives and examples from various cultures, genders, and backgrounds. For instance, discussing contributions to calculus from mathematicians of different nationalities and backgrounds can highlight diversity. Also, using a range of sources, including those authored by individuals from underrepresented groups, to provide a more comprehensive view of the topic. Equitable: Ensure all students have access to the necessary resources and support to complete their papers. This might include providing access to online journals, libraries, or writing assistance. Use fair and transparent assessment criteria that recognize effort, improvement, and understanding, rather than just final outcomes. Inclusive: Use inclusive language that respects all individuals and groups. Avoid biased or exclusive terminology. Select topics that are relevant and meaningful to a broad audience. For example, discussing the impact of calculus on various fields such as economics, biology, and social sciences can make the subject more relatable. Accessible: Provide the paper in accessible formats, such as digital copies that are compatible with screen readers for visually impaired students. Offer clear guidelines and support for students with disabilities, ensuring they can participate fully in the assignment. This may involve extended deadlines, alternative formats, or additional support.

i. Cumulative finals or certifications (1-1%)

- **Comment:** Description: Comprehensive exam covering all course material. Example: A final exam with problems on all major topics, including limits, derivatives, integrals, and the Fundamental Theorem of Calculus that may be given orally or written. Addressing DEIA in this Evaluation Method: Diverse: The cumulative final exam covers a broad range of topics from the entire course, offering students an opportunity to demonstrate their understanding of a diverse array of concepts and skills acquired throughout the term. Equitable: The grading process for the final exam is consistent, and any potential biases are carefully considered and addressed to ensure fairness in assessment. Inclusive: The final exam is designed with inclusive language and questions that avoid cultural biases, ensuring that all students, regardless of their backgrounds, have an equal opportunity to perform well. Accessible: The final exam is administered in an accessible format, with clear instructions and accessible technology or accommodations available for students with diverse learning needs, ensuring equitable access to the assessment.

Diversity, Equity, Inclusion, Accessibility and Antiracism (DEIAA)

To facilitate committee DEIA review, please select which COR components incorporate Diversity, Equity, Inclusion, and Accessibility (DEIA) principles/strategies (select all that apply):

- Class Assignments
- Content
- Methods of Evaluation (Formative and summative assessments were selected)

- Methods of Instruction (Equity-minded instruction, active-learning, and personalized learning strategies were selected)
- Resources (Zero cost textbooks and/or strategies to lower the costs of resources)

Last Revision
2025-11-10

Board Approval
2021-05-13