Cerro Coso College

Course Outline of Record Report

10/18/2021

MATHC151 : Analytic Geometry and Calculus I

General Information

Author:	• Steven Rogers • Bernsten, Dean • Bonner, Michael • Kessler, Jaclyn • Slovacek, Joseph
Course Code (CB01) :	MATHC151
Course Title (CB02) :	Analytic Geometry and Calculus I
Department:	Mathematics
Proposal Start:	Summer 2021
TOP Code (CB03) :	(1701.00) Mathematics, General
SAM Code (CB09) :	Non-occupational
Distance Education Approved:	Yes
Course Control Number (CB00) :	CCC000265383
Curriculum Committee Approval Date:	10/20/2017
Board of Trustees Approval Date:	12/14/2017
External Review Approval Date:	Pending
Course Description:	This course provides students with a foundation in differential and integral calculus with emphasis on both skills and applications. Topics include functions, limits, derivatives of polynomial, trigonometric, parametric, and implicit functions, applications of differentiation, the indefinite integral, the definite integral, and applications of the definite integral.
Submission Type:	Mandatory Revision additional topics are being added to align with the c-id descriptor.
Author:	No value

Faculty Minimum Qualifications

Master Discipline Preferred:	• Mathematics
Alternate Master Discipline Preferred:	• Engineering • Physics/Astronomy
Bachelors or Associates Discipline Preferred:	No value
Additional Bachelors or Associates Discipline Preferred:	No value

Course Formerly Known As

Course Formerly Known As

No Value

Course Development Options

Basic Skills Status (CB08)

Course is not a basic skills course.

Course Special Class Status (CB13)

Course is not a special class.

Grade Options

- Letter Grade Methods
- Pass/No Pass

☐ Allow Students to Gain Credit by Exam/Challenge

Allowed Number of Retakes

0

Course Prior To College Level (CB21)

Not applicable.

Rationale For Credit By Exam/Challenge

No value

Retake Policy Description

Type:|Non-Repeatable Credit

☑ Allow Students To Audit Course

Course Support Course Status (CB26)

Course is not a support course

Associated Programs

☑ Course is part of a program (CB24)

Associated Program	Award Type	Active
CC General Sciences	A.A. Degree Major	Spring 2018
CC Liberal Arts: Mathematics & Science	A.A. Degree Major	Summer 2018 to Fall 2020
Associate in Science Degree In Mathematics for Transfer	A.A. Degree for Transfer	Summer 2018
CC Computer Information Systems-	Certificate of Achievement	Spring 2018 to Summer 2019
CC Computer Information Systems	A.S. Degree Major	Spring 2018 to Summer 2019
CSU General Education (CSU GE Breadth) (In Development)	Certificate of Achievement	Fall 2021
Intersegmental General Education Transfer Curriculum Certificate of Achievement (In Development)	Certificate of Achievement	Fall 2021

CC Information Technology	Certificate of Achievement	Summer 2019
CC Information Technology	A.S. Degree Major	Summer 2019
Economics Associate in Arts Degree for Transfer (AA-T)	A.A. Degree for Transfer	Spring 2020 to Spring 2020
CSU General Education (CSU GE Breadth)	Certificate of Achievement	Fall 2020
Intersegmental General Education Transfer Curriculum Certificate of Achievement	Certificate of Achievement	Fall 2020
Economics Associate in Arts Degree for Transfer	A.A. Degree for Transfer	Spring 2020
Liberal Arts: Mathematics & Science Associate in Arts Degree	A.A. Degree Major	Fall 2020

Transferability & Gen. Ed. Options

Course General Education Status (CB25)

Y

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

Cerro Coso General Education Requirements	Categories	Status	Approval Date	Comparable Course
Area 4.2	Language & Rationality Analytical Thinking	Approved	No value	MATH 210

CSU General Education Certification	Categories	Status	Approval Date	Comparable Course
Area B.4	Scientific Inquiry & Quantitative Reasoning Mathematics / Quantitative Reasoning	Approved	No value	No Comparable Course defined.

Intersegmental General Education Transfer Curriculum	Categories	Status	Approval Date	Comparable Course
Area 2	Mathematical Concepts & Quantitative Reasoning	Approved	No value	No Comparable Course defined.

C-ID	Categories	Status	Approval Date	Comparable Course
Mathematics	C-ID discipline	Pending	No value	C-ID # MATH 210

Units and Hours

Summary

Minimum Credit Units (CB07)	4
Maximum Credit Units (CB06)	4
Total Course In-Class (Contact) Hours	72
Total Course Out-of-Class Hours	144
Total Student Learning Hours	216
Faculty Load	0

Credit / Non-Credit Options

Course Credit Status (CB04)

Credit - Degree Applicable

Course Non Credit Category (CB22)

Credit Course.

Non-Credit Characteristic

No Value

Course Classification Status (CB11)

Credit Course.

Funding Agency Category (CB23)

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

☐ Variable Credit Course

Weekly Student Hours

	In Class	Out of Classs
Lecture Hours	4	8
Laboratory Hours	0	0
Activity Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	
Lecture	72
Laboratory	0
Activity	0
Total	72

Course Out-of-Class Hours

Lecture	144
Laboratory	0
Activity	0
Total	144

Time Commitment Notes for Students

No value

Faculty Load

Extra Duties: 0

Faculty Load: 0

Units and Hours - Weekly Specialty Hours

Activity Name	Type	In Class	Out of Class
No Value	No Value	No Value	No Value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Prerequisite

MATHC141 - Precalculus: Algebra

In Math C151 students are expected to consistently perform signed number operations correctly; demonstrate proficiency with operations of algebraic fractions; use the rules of exponents and radicals to simplify expressions and solve equations; recognize the difference between functions and non-functions; graph a line and write the equation of a line; recognize and graph at least one quadratic – parabola, circle, ellipse, or hyperbola; solve a linear system of equations by at least two of the following methods: graphing, substitution, addition elimination, Cramer's rule; solve quadratic equations by at least two of the following methods: factoring, completing the square, quadratic formula, graphing calculator; graph exponential and logarithmic functions; use the properties of exponential and logarithmic functions to solve equations; set up and solve word problems related to the skills above. Students successfully demonstrating these Math C141 skills will be prepared for Math C151.

AND

Prerequisite

MATHC142 - Trigonometry

In Math C151 students are expected to consistently interrelate the multiple definitions of the trigonometric functions and their inverses; determine the appropriate trigonometric ratio or law to apply to solve problems with triangles; use the radian measure effectively in conversions and it applying formulas to solve problems; analyze trigonometric functions and their graphs using the concepts of amplitude, period, phase and vertical shifts and apply these ideas to real problems; recognize and verify or prove trigonometric identities; analyze trigonometric equations to determine what combination of algebra and identities will lead to a solution; apply trigonometry to operations with complex
numbers; solve problems and graph equations of conic sections in rectangular and polar coordinate systems in two and three dimensions; identify and solve problems using parametric equations and vectors in the plane and in space. Students successfully

demonstrating these Math C142 skills will be prepared for Math C151.

Entrance Skills

Entrance Skills	Description
No value	No value

Limitations on Enrollment

Limitations on Enrollment	Description
No value	No value

Specifications

Methods of Instruction

Methods of Instruction	Lecture
Rationale	Students are taught several rules that allow them to differentiate the following: 1. constant functions 2. power functions 3. polynomials 4. rational functions 5. combinations of the above All of these procedures are best presented in a lecture format.
Methods of Instruction	Discussion
Rationale	Given graphs of various functions, students discuss why or why not they are: 1. differentiable 2. continuous but not differentable 3. neither continuous nor differentiable
Methods of Instruction	Group Work
Rationale	Students work in small groups to perform the following: 1. Find the equation of a tangent line to the graph of a function at a point on the graph. 2. Graph functions using methods of calculus. 3. Compute derivatives using differentiation formulas.

Assignments

A. Daily homework assignments Example: Students work mathematics problems assigned from the text and from hand-outs to reinforce concepts and skills discussed in lecture.
Sample homework problem: When a circular plate of metal is heated in an oven, its radius increases at the rate of 0.01 cm/min. At what rate is the plates's area increasing when the radius is 50 cm?
B. Online
Course Management System Example: Assignments on MyMathLab

Methods of Evaluation	Rationale
Tests	Chapter exams over the lecture material, homework, and in-class assignments assess the student's understanding. As an example, students take a chapter exam involving the techniques of differentiation. Weekly Quizzes Weekly quizzes over the previous week's lecture material, homework, and in-class assignments assess the student's understanding. As an example, students are asked to find the limit of a given function as x approaches a certain value.
Homework	Homework assignments Example: Students work mathematics problems assigned from the text and from hand-outs to reinforce concepts and skills discussed in lecture.
Distance Education Description: how outcomes are evaluated	A. Proctored Online Exams: As an example, students take a chapter exam involving differentiation rules. B. Online Homework Assignments: As an example, students complete an online homework assignment where they do the following: 1. Differentiate by applying the chain rule 2. Differentiate implicitly defined functions 3. Use the derivative to solve a variety of optimization problems in business, mathematics, physics, and economics

Equipment

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Hass, Heil, Weir	Thomas' Calculus 14th ed., Media Upgrade. With MyMathLab,	Addison-Wesley	2017	

Other Instructional Materials

No Value

Materials Fee

No

Learning Outcomes and Objectives

Course Objectives

Compute the limit of a function at a real number.

Determine if a function is continuous at a real number.

Find the derivative of a function as a limit.

Find the equation of a tangent line to the graph of a function at a point on the graph.

Compute derivatives using differentiation formulas.

Use differentiation to solve applied problems such as related rate problems and optimization problems.

Use implicit differentiation.

Graph functions using methods of calculus.

Evaluate a definite integral as a limit.

Evaluate integrals using the Fundamental Theorem of Calculus.

Apply integration to find areas and volumes.

CSLOs

1. Evaluate functions analytically and graphically using limits, derivatives, definite, and indefinite integrals. Expected SLO Performance: 70.0

2. Apply Epsilon-Delta proofs to determine limits and employ the Fundamental Theorem of Calculus to model and solve problems. Expected SLO Performance: 70.0

Science Liberal Arts: Mathematics & Science AA Degree	Apply algebraic, graphical, numerical, and other methods to solve applied problems in the areas of mathematics, natural sciences, computer graphics, and computer animation.

Social Science IGETC PLOs	Use a complex symbol system to solve problems.
Social Science PLOs for CSU GE COA	Use a complex symbol system to solve problems.

3. Define the limit of a function, and calculate limits using the limit laws.

Expected SLO Performance: 70.0

4. Differentiate polynomial, exponential, trigonometric, and logarithmic functions, as well as products, quotients and compositions.

Expected SLO Performance: 70.0

ISLOs Core ISLOs	Students who are completing a program will be able to access, evaluate, and effectively use information.

Outline

Course Outline

The Mathematics Department has adopted the following best practices for teaching this course: offering or awarding extra-credit is forbidden, the allowance of multiple attempts at exams is forbidden, and an approved on-site proctor for online course exams is required.

A. Functions
1. Functions and Their Graphs
2. Combining Functions: Shifting and Scaling Graphs
3. Trigonometric Functions
4. Inverse Functions
5. Graphing with Calculators

B. Limits and Their Properties
1. Finding Limits Graphically and Numerically
2. Evaluating Limits Analytically
3. Continuity and One-Sided Limits
4. Limits Involving Infinity: Graphing Functions Using Asymptotes
5. Squeeze Theorem
6. Indeterminate Forms
7. L'Hopital's Rule

C. Differentiation
1. Derivative of a Polynomial
2. Power Rule
3. Product Rule
4. Quotient Rule
5. Implicit Differentiation with applications
6. Chain Rule
7. Differentials and Linear Approximations
8. Derivatives of the Trigonometric Functions
9. Higher Order Derivatives
   a. Polynomial Functions
   b. Implicit Functions

D. Applications of Differentiation
1. Curve Sketching
   a. Sign of first derivative – increasing and decreasing
   b. Sign of second derivative - concavity
   c. Relative maxima, minima
   d. Points of inflection
2. Velocity and Acceleration
3. Related Rates
4. Maxima, Minima Problems
5. Newton's Method (Newton-Raphson)
6. Equations of Lines Tangent and Normal to a Curve
7. Mean Value Theorem
8. Rolle's Theorem

E. Integration
1. Indefinite Integral
   a. Anti-differentiation
   b. Of the form c du, u du, du+dv
   c. Integrals of the Trigonometric Functions
2. Applications of the Indefinite Integral
   a. Solutions to Simple Differential Equations with Initial Conditions
   b. Velocity and Position
   c. Equation of a Family of Curves
3. Numerical Methods for the Definite Integral
   a. Circumscribed Rectangles
   b. Inscribed Rectangles
   c. Riemann Sum

d. Trapezoidal Method
e. Simpson's Method
4. The Fundamental Theorem of Integral Calculus
a. Evaluation of Definite Integrals
b. Properties of the Definite Integral
b. Substitution Method Applied to Definite Integrals
5. Differentiation of inverse functions

Delivery Methods

Delivery Method: Please list all that apply -Face to face -Online (purely online no face-to-face contact) -Online with some required face-to-face meetings (“Hybrid”) -Online course with on ground testing -iTV – Interactive video = Face to face course with significant required activities in a distance modality -Other

- Face to face
- Online (purely online no face-to-face contact)
- Online with some required face-to-face meetings (“Hybrid”)
- Online course with on ground testing
- iTV – Interactive video = Face to face course with significant required activities in a distance modality

Rigor Statement: Assignments and evaluations should be of the same rigor as those used in the on-ground course. If they are not the same as those noted in the COR on the Methods of Evaluation and out-of-class assignments pages, indicate what the differences are and why they are being used. For instance, if labs, field trips, or site visits are required in the face to face section of this course, how will these requirements be met with the same rigor in the Distance Education section? Describe the ways in which instructor-student contact and student-student contact will be facilitated in the distance ed environments.

The assignments and evaluations will be the same no matter what delivery method is used. The outcomes for this course, both for on-ground and online classes, will be evaluated and assessed using multi-part exam questions allowing for partial credit. The artifacts used to assess the outcomes may be put on chapter exams throughout the semester or on a comprehensive final exam at the end of the semester.

Student-Instructor contact will include the following: discussion forums, learning management system messages, announcements, and feedback for each student’s work. Student-Instructor contact MAY include the following: chat/Zoom, newsgroup/discussion board, phone, and iTV. Student-Student contact will include the following: discussion forums. Student-Student contact MAY include the following: chat/Zoom, learning management system messages, group work, and peer reviewed assignments

Good practice requires both asynchronous and synchronous contact for effective contact. List the methods expected of all instructors teaching the course. -Learning Management System -Discussion Forums -Message -Other Contact -Chat/Instant Messaging -E-mail -Face-to-face meeting(s) -Newsgroup/Discussion Board -Proctored Exam -Telephone -iTV - Interactive Video -Other

- Discussion Forums
- Chat/Instant Messaging
- E-mail
- Proctored Exam

Software and Equipment: What additional software or hardware, if any, is required for this course purely because of its delivery mode? How is technical support to be provided?

For sections using Pearson MyMathLab, certain web browsers may perform better than others with the course online management system. Current versions of Adobe and Java may also need to be installed to gain full access to all of the Pearson help aids. Technical support is provided by Pearson via a toll free student technical assistance phone number.

Accessibility: Section 508 of the Rehabilitation Act requires access to the Federal government's electronic and information technology. The law covers all types of electronic and information technology in the Federal sector and is not limited to assistive technologies used by people with disabilities. It applies to all Federal agencies when they develop, procure, maintain, or use such technology.

Federal agencies must ensure that this technology is accessible to employees and the public to the extent it does not pose an "undue burden". I am using -iTV—Interactive Video only -Learning management system -Publisher course with learning management system interface.

- Learning management system
- Publisher course with learning management system interface.

Class Size: Good practice is that section size should be no greater in distance ed modes than in regular face-to-face versions of the course. Will the recommended section size be lower than in on-ground sections? If so, explain why.

The Pearson learning management system is accessible and compatible with the Canvas site. Faculty will use the Canvas accessibility checker, along with other resources provided by our Distance Education Director, to ensure all learning materials are accessible, including but not limited to documents, pdfs, OERs, external websites, and videos.

Emergency Distance Education Options The course will operate in remote delivery mode when all or part of the college service area is under an officially declared city, county, state, or federal state of emergency, including (check all that apply) - Online including all labs/activity hours - Hybrid with online lecture and onsite lab/activity hours - Correspondence education in high school and prison facilities - None. This course will be cancelled or paused if it cannot be held fully onsite.

- Online including all labs/activity hours
- Hybrid with online lecture and onsite lab/activity hours
- Correspondence education in high school and prison facilities