Course Outline of Record Report

MATH103E+ : Calculus and Analytic Geometry I with Support

General Information

Author:	• Suzanne Palermo
Course Code (CB01) :	MATH103E+
Course Title (CB02) :	Calculus and Analytic Geometry I with Support
Department:	MATH
Proposal Start:	Fall 2024
TOP Code (CB03) :	(1701.00) Mathematics, General
CIP Code:	(27.0101) Mathematics, General.
SAM Code (CB09) :	Non-Occupational
Distance Education Approved:	No
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000642843
Curriculum Committee Approval Date:	12/13/2023
Board of Trustees Approval Date:	01/09/2024
Last Cyclical Review Date:	12/13/2023
Course Description and Course Note:	MATH 103E+ is the first of a sequence of three courses combining the subject matter of analytic geometry and calculus. The course covers functions and their graphs with special attention to differentiation, limits, rules and integration using various techniques. Students study the calculus of inverse functions and transcendental functions as well as applications of differentiation. Students also learn support topics such as algebra, trigonometry, limits, derivatives, and integrals.
Justification:	New Course
Academic Career:	• Credit
Author:	• Suzanne Palermo

Academic Senate Discipline

Primary Discipline:	• Mathematics
Alternate Discipline:	
Alternate Discipline:	

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

Course Special Class Status (CB13)

Course is not a special class.

Pre-Collegiate Level (CB21)

Grading Basis

• Grade with Pass / No-Pass Option

Course Support Course Status (CB26)

☐ Allow Students to Gain Credit by Exam/Challenge	Not applicable.	Course is not a support course

Transferability & Gen. Ed. Options

General Education Status (CB25)

GE Status (CSU) B4, (UC) 2

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

C-ID	Area	Status	Approval Date	Comparable Course
MATH	Mathematics	Pending	No value	MATH 210 - Single Variable Calculus I Early Transcendentals

CSU GE-Breadth Area	Area	Status	Approval Date	Comparable Course
B4-Mathematics/Quantitative Reasoning	Mathematics/Quantitative Reasoning	Pending	No value	No Comparable Course defined.

IGETC Area	Area	Status	Approval Date	Comparable Course
2-Math	Mathematical Concepts and Quantitative Reasoning	Pending	No value	No Comparable Course defined.

Units and Hours

Summary

Minimum Credit Units (CB07)	6
Maximum Credit Units (CB06)	6
Total Course In-Class (Contact) Hours	144
Total Course Out-of-Class Hours	180
Total Student Learning Hours	324

Credit / Non-Credit Options

Course Type (CB04)	**Noncredit Course Category (CB22)**	**Noncredit Special Characteristics**
Credit - Degree Applicable	Credit Course.	No Value

Course Classification Code (CB11)	**Funding Agency Category (CB23)**	

Credit Course.   Not Applicable.

☐ Variable Credit Course

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	5	10
Laboratory Hours	3	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	
Lecture	90
Laboratory	54
Studio	0
Total	144
Course Out-of-Class Hours	
Lecture	180
Laboratory	0
Studio	0
Total	180

Time Commitment Notes for Students

No value

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

Prerequisite

MATH110 - Precalculus

Objectives

- Solve equations including rational, linear, polynomial, exponential, absolute value, radical, and logarithmic.
- Solve linear, non-linear, and absolute value inequalities.
- Graph the following types of functions and relations: polynomial, rational, exponential, logarithm, and conic section.
- Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs.
- Solve exponential and logarithmic equations.
- Apply the Fundamental Theorem of Algebra and related theorems to find the roots of a polynomial.
- Prove various trigonometric identities.
- Solve trigonometric equations.
- Apply the basic definitions of trigonometry to solve right triangle application problems.
- apply the laws of sines and cosines to solve application problems.
- Graph both polar and parametric equations.

OR

Prerequisite

MATH110B - Precalculus II

Objectives

- Solve equations including rational, linear, polynomial, exponential, absolute value, radical, and logarithmic.
- Solve linear, non-linear, and absolute value inequalities.
- Graph the following types of functions and relations: polynomial, rational, exponential, logarithm, and conic section.
- Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs.
- Solve exponential and logarithmic equations.
- Apply the Fundamental Theorem of Algebra and related theorems to find the roots of a polynomial.
- Prove various trigonometric identities.

- Solve trigonometric equations.
- Apply the basic definitions of trigonometry to solve right triangle application problems.
- Apply the laws of sines and cosines to solve application problems.
- Graph both polar and parametric equations.

OR

Prerequisite

Placement is based on academic background or successful completion of MATH 110 or MATH 110A and MATH 110B.

Entry Standards

Entry Standards

No value

Specifications

Methods of Instruction

| Methods of Instruction | Lecture |

| Methods of Instruction | Laboratory |

| Methods of Instruction | Discussion |

| Methods of Instruction | Multimedia |

| Methods of Instruction | Tutorial |

| Methods of Instruction | Collaborative Learning |

| Methods of Instruction | Demonstrations |

| Methods of Instruction | Guest Speakers |

Methods of Instruction	Presentations

Out of Class Assignments

- Homework (e.g. problem sets related to course content)
- Assignments and/or projects (e.g. group projects to solve a "challenging" application problem from the textbook)

Methods of Evaluation

Methods of Evaluation	Rationale
Exam/Quiz/Test	Quizzes
Exam/Quiz/Test	Four or more chapter examinations are required
Exam/Quiz/Test	A comprehensive final examination

Textbook Rationale

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Briggs, William	Calculus, Early Transcendentals	Cengage Learning	2019	9780134763644

Other Instructional Materials (i.e. OER, handouts)

Description	Precalculus
Author	Abramson, Jay
Citation	https://openstax.org/details/books/precalculus-2e
Online Resource(s)	

Materials Fee

No value

Learning Outcomes and Objectives

Course Objectives

Find limits of functions at real values and at infinity using numerical, graphical, and algebraic approaches.

Determine and prove continuity and differentiability of a function at a real value.

Find the derivative of a function as a limit.

Use the derivative for rate of change problems.

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

Compute derivatives using differentiation formulas: constants, power rule, product rule, quotient rule and chain rule. Calculate higher order derivatives.

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

Use implicit differentiation with applications, including in differentiation of inverse functions.

Find derivatives of transcendental functions: trigonometric, exponential, logarithmic, and others.

Determine relative and absolute maximum and minimum points of functions and points of inflection.

Graph functions using the methods of calculus.

Use the Mean Value Theorem.

Evaluate a definite integral as a limit of Riemann sums.

Apply integration to find areas, apply properties of integrals.

Evaluate antiderivatives and indefinite integrals.

Evaluate integrals using the Fundamental Theorem of Calculus.

Use substitution to integrate.

Apply l'Hospital's rule to find limits of indeterminate forms.

SLOs

Find limits, derivatives, and integrals of algebraic, trigonometric, transcendental, and inverse functions.   Expected Outcome Performance: 70.0

Use limits, derivatives, and integrals to graph functions and solve application problems.   Expected Outcome Performance: 70.0

Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No

Is this proposal submitted in response to learning outcomes assessment data?

No

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Review and Preview (12 hours)
- Four Ways to Represent a Function
- Mathematical Models
- New Functions from Old Functions
- Exponential Functions
- Inverse Functions and Logarithms
- Motivation for college success in mathematics
- Math test taking techniques

Limits and Rates of Change (18 hours)
- The Tangent and Velocity Problems
- The Limit of a Function
- Calculating Limits using the Limit Laws
- The Precise Definition of a Limit
- Continuity
- Limits at Infinity; Horizontal Asymptotes
- Derivatives and Rates of Change
- The Derivative as a Function
- Study Skills: Critical Thinking Skills

Differentiation Rules (22 hours)
- Derivatives of Polynomials and Exponential Functions
- Differentiation Formulas
- Derivatives of Trigonometric Functions
- The Chain Rule
- Implicit Differentiation
- Derivatives of Logarithmic Functions
- Rates of Change in the Natural and Social Sciences
- Exponential Growth and Decay
- Related Rates
- Linear Approximations and Differentials
- Hyperbolic Functions
- STEM exploration and community resources

Applications of Differentiation (22 hours)
- Maximum and Minimum Values
- The Mean Value Theorem
- How Derivatives Affect the Shape of a Graph
- Indeterminate Forms and l'Hospital's rule
- Graphing functions using first and second derivatives, concavity and asymptotes

- Graphing with technology (Optional)
- Optimization Problems
- Newton's Method
- Antiderivatives
- College math support resources

Integrals (16 hours)
- Areas and Distances
- The Definite Integral
- The Fundamental Theorem of Calculus
- Indefinite Integrals and the Net Change Theorem
- The Substitution Rule

Total hours: 90

Laboratory/Studio Content

Mathematical Review Content (33 hours)
- Algebra Review
- Trigonometric Review
- Graphing Review

Calculus Content (21 hours)
- Limits
- Derivatives
- Integrals
- Calculus applications

Total hours: 54