MATH103E : Calculus & Analytic Geometry I

General Information

Author:	• Suzanne Palermo
Course Code (CB01) :	MATH103E
Course Title (CB02) :	Calculus & Analytic Geometry I
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) :	CCC000598024
Curriculum Committee Approval Date:	05/08/2024
Board of Trustees Approval Date:	06/18/2024
Last Cyclical Review Date:	05/08/2024
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. Functions and their graphs are studied with special attention to differentiation, limits, rules and integration using various techniques. The calculus of inverse functions and transcendental functions as well as applications of differentiation is also covered.
Justification:	Mandatory Revision
Academic Career:	• Credit
Author:	No value

Academic Senate Discipline

Primary Discipline:	• Mathematics
Alternate Discipline:	No value
Alternate Discipline:	No value

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

☐ Allow Students to Gain Credit by Exam/Challenge

Course Special Class Status (CB13)

Course is not a special class.

Pre-Collegiate Level (CB21)

Not applicable.

Grading Basis

- Grade with Pass / No-Pass Option

Course Support Course Status (CB26)

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

IGETC Area	Area	Status	Approval Date	Comparable Course
2-Math	Mathematical Concepts and Quantitative Reasoning	Approved	09/03/2019	No Comparable Course defined.

CSU GE-Breadth Area	Area	Status	Approval Date	Comparable Course
B4-Mathematics/Quantitative Reasoning	Mathematics/Quantitative Reasoning	Approved	08/27/2018	No Comparable Course defined.

C-ID	Area	Status	Approval Date	Comparable Course
MATH	Mathematics	Approved	08/30/2021	MATH 210 - Single Variable Calculus I Early Transcendentals

Units and Hours

Summary

Minimum Credit Units (CB07)	5
Maximum Credit Units (CB06)	5
Total Course In-Class (Contact) Hours	90
Total Course Out-of-Class Hours	180
Total Student Learning Hours	270

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (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 Class

Course Student Hours

Course Duration (Weeks) 18

Lecture Hours	5	10
Laboratory Hours	0	0
Studio Hours	0	0

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

Time Commitment Notes for Students

No value

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

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

- 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 successful completion of MATH 110 or MATH 110B or academic background.

Entry Standards

Entry Standards

Course Limitations

Cross Listed or Equivalent Course

MATH 103EH - Honors Calculus & Analytics Geometry I

Specifications

Methods of Instruction

Methods of Instruction	Lecture
Methods of Instruction	Discussion
Methods of Instruction	Multimedia
Methods of Instruction	Collaborative Learning
Methods of Instruction	Demonstrations

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

Textbook Rationale

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Briggs, Cochran, Gillet and Schultz	Calculus Early Transcendentals	Pearson	2019	9780134763644

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

No Value

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

GEOL Geology AS-T Degree	Apply reasoning to evaluate hypotheses and theories; analyze, interpret, and present research evidence
	Develop foundational knowledge to be able to use evidence-based approaches to explore and evaluate global issues such as natural disaster preparation, energy, resources, and climate
MATH Mathematics A.S. Degree	Evaluate limits, derivatives and integrals
MATH Mathematics - A.A. Degree Major	Evaluate limits, derivatives and integrals.
ILOs Core ILOs	Use quantitative and/or analytical mathematical skills to solve problems and to interpret, evaluate, and process information and data to draw logical conclusions and support claims.

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

ILOs Core ILOs	Analyze and solve problems using critical, logical, and creative thinking; ask questions, pursue a line of inquiry, and derive conclusions; cultivate creativity that leads to innovative ideas.
	Use quantitative and/or analytical mathematical skills to solve problems and to interpret, evaluate, and process information and data to draw logical conclusions and support claims.
GEOL Geology AS-T Degree	Apply reasoning to evaluate hypotheses and theories; analyze, interpret, and present research evidence
	Develop foundational knowledge to be able to use evidence-based approaches to explore and evaluate global issues such as natural disaster preparation, energy, resources, and climate
MATH Mathematics - A.A. Degree Major	Evaluate limits, derivatives and integrals.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
MATH Mathematics A.S. Degree	Solve applications in math and science using derivatives, integrals, differential equations and linear algebra

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

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

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

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

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

Additional Information

Is this course proposed for GCC Major or General Education Graduation requirement? If yes, indicate which requirement in the two areas provided below.

Yes

GCC Major Requirements

Mathematics

GCC General Education Graduation Requirements

Communication and Analytical Thinking

Repeatability

Not Repeatable

Justification (if repeatable was chosen above)

No Value

Resources

Did you contact your departmental library liaison?

No

If yes, who is your departmental library liason?

No Value

Did you contact the DEIA liaison?

No

Were there any DEIA changes made to this outline?

No

If yes, in what areas were these changes made:

No Value

Will any additional resources be needed for this course? (Click all that apply)

- No

If additional resources are needed, add a brief description and cost in the box provided.

No Value