

MATH112+ : Calculus for Business with Support

General Information

Author:	<ul style="list-style-type: none">Suzanne PalermoShamhart, William
Course Code (CB01) :	MATH112+
Course Title (CB02) :	Calculus for Business 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:	Yes
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000607060
Curriculum Committee Approval Date:	12/13/2023
Board of Trustees Approval Date:	01/09/2024
Last Cyclical Review Date:	03/01/2019
Course Description and Course Note:	MATH 112+ is a one-semester course in calculus for business, management, and social science majors. This course has a built-in support lab component. Topics in this course include: techniques of differentiating; maximum-minimum problems; curve sketching; derivatives and applications of exponential and logarithmic functions; techniques of integration; and simple differential equations
Justification:	Content Change
Academic Career:	<ul style="list-style-type: none">Credit

Academic Senate Discipline

Primary Discipline:	<ul style="list-style-type: none">Mathematics
Alternate Discipline:	
Alternate Discipline:	

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	08/31/2020	No Comparable Course defined.

CSU GE-Breadth Area	Area	Status	Approval Date	Comparable Course
B4-Mathematics/Quantitative Reasoning	Mathematics/Quantitative Reasoning	Approved	08/31/2020	No Comparable Course defined.

C-ID	Area	Status	Approval Date	Comparable Course
MATH	Mathematics	Pending	No value	MATH 140 - Business Calculus

Units and Hours**Summary****Minimum Credit Units (CB07)** 5.5**Maximum Credit Units (CB06)** 5.5**Total Course In-Class (Contact) Hours** 135**Total Course Out-of-Class Hours** 180**Total Student Learning Hours** 315**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.

 Variable Credit Course**Funding Agency Category (CB23)**

Not Applicable.

Cooperative Work Experience

 Education Status (CB10)**Weekly Student Hours**

	In Class	Out of Class
Lecture Hours	5	10
Laboratory Hours	2.5	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	0
Course In-Class (Contact) Hours	
Lecture	90
Laboratory	45
Studio	0
Total	135
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**

MATH90 - Intermediate Algebra for BSTEM

Objectives

- Solve absolute value equations and inequalities.
- Solve linear equations and compound inequalities.
- Perform operations with polynomials.
- Perform operations with radical expressions.
- Simplify expressions with rational exponents.
- Solve rational equations.
- Find the equation of a line parallel or perpendicular to a given line.
- Solve quadratic equations with real and complex solutions.
- Find the inverse of a function.
- Use the properties of logarithms to simplify and expand expressions.
- Solve logarithmic and exponential equations.
- Graph parabolas and circles centered at any point.
- Graph functions (linear, quadratic, exponential, logarithmic).

OR

Prerequisite

Placement is based on academic background or satisfactory completion of MATH 90.

Entry Standards

Entry Standards

No value

Course Limitations

Cross Listed or Equivalent Course

MATH 112 Calculus for Business

Specifications

Methods of Instruction

Methods of Instruction Lecture

Methods of Instruction Discussion

Methods of Instruction Multimedia

Methods of Instruction Demonstrations

Out of Class Assignments

- Homework (e.g. problem sets related to course content)
- Group assignments and projects (e.g. analyze a business' profit and loss, analyze supply and demand for a product)
- Computer or graphing calculator assignments

Methods of Evaluation

Rationale

Exam/Quiz/Test

Quizzes

Exam/Quiz/Test

5-7 chapter examinations are required

Exam/Quiz/Test

A comprehensive final examination is required

Textbook Rationale

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Stefan Waner, Steven Costenoble	Applied Calculus	Cengage	2023	978-0357723487

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

Description	Mathematics Division generated materials
Author	No value
Citation	No value
Online Resource(s)	

Materials Fee

No value

Learning Outcomes and Objectives

Course Objectives

Demonstrate understanding of exponents, linear equations and inequalities, and functions.

Differentiate various types of functions by using the product, quotient and chain rules.

Find the derivatives of polynomial, rational, exponential and logarithmic functions.

Use derivatives to find rates of change and tangent lines.

Sketch the graph of functions using horizontal and vertical asymptotes, intercepts, and first and second derivatives to determine intervals where the function is decreasing and increasing, maximum and minimum values, intervals of concavity and points of inflection.

Apply the rules of differentiation to solve optimization problems.

Use calculus to analyze revenue, cost and profit.

Apply the calculus of exponential and logarithmic functions to application problems.

Apply the various techniques of integration to definite, indefinite, and improper integrals by using the general integral formulas, integration by substitution, and other integration techniques.

Analyze the marginal cost, profit and revenue when given the appropriate function.

Use integration in business and economics applications.

Solve separable differential equations.

SLOs

Find, apply, and interpret graphic, symbolic, numerical/data, and verbal/applied representations of the derivative.

Expected Outcome Performance: 70.0

<i>ILOs</i> 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.
<i>MATH</i> Mathematics - A.A. Degree Major	Evaluate limits, derivatives and integrals. solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
<i>ILOs</i> General Education	apply techniques of analysis and critical thinking to critique real world and theoretical topics and issues

Find, apply, and interpret graphic, symbolic, numerical/data, and verbal/applied representations of integration.

Expected Outcome Performance: 70.0

<i>ILOs</i> 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.
<i>MATH</i> Mathematics - A.A. Degree Major	Evaluate limits, derivatives and integrals. solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
<i>ILOs</i> General Education	apply techniques of analysis and critical thinking to critique real world and theoretical topics and issues

Apply calculus to business related application problems.

Expected Outcome Performance: 70.0

<i>ILOs</i> 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.
<i>MATH</i> Mathematics - A.A. Degree Major	Evaluate limits, derivatives and integrals. solve applications in math and science using derivatives, integrals, differential equations and linear algebra.

Additional SLO Information

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

No Value

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

No Value

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

Preliminaries (8 hours)

- Algebra review
- The Cartesian Coordinate System
- Lines

Functions, Limits, and the Derivative (15 hours)

- Functions and their graphs, including exponential and logarithmic functions
- The algebra of functions
- Functions and mathematical models
- Limits and intuitive limit definition of derivative
- One-sided limits and continuity
- Increments, tangent lines and rate of change

Differentiation (15 hours)

- Rules of differentiation, including sum, difference, product and quotient rules
- The chain rule
- Marginal functions in economics
- Higher-order derivatives
- Implicit differentiation and related rates
- Differentials

Applications of the Derivative (16 hours)

- Applications of the first derivative – increasing/decreasing and extrema
- Applications of the second derivative – concavity and points of inflection
- Curve sketching
- Optimization - extreme value theorem
- Optimization – applications

Exponential and Logarithmic Functions (14 hours)

- Exponential functions
- Logarithmic functions
- Compound interest
- Differentiation of exponential functions
- Differentiation of logarithmic functions
- Exponential functions as mathematical models

Integration (15 hours)

- Antiderivatives, indefinite integrals and the rules of integration

- Integration by substitution
- Approximating definite integral as a sum
- Area and the definite integral
- The Fundamental Theorem of Calculus
- Evaluating definite integrals
- Area between two curves
- Applications of the definite integral to business and economics

Additional Topics in Integration (7 hours)

- Integration by parts
- Numerical integration (optional)
- Improper integrals

Total Hours: 90

Laboratory/Studio Content

Laboratory Content (45 hours)

- Geometry Review
 - Perimeter
 - Area
- Calculator use
- Exponents
 - Properties
 - Rational exponents
- Multiplication of polynomials
- Factoring polynomials
- Rational expressions
 - Zero in numerator and/or denominator
 - Working with averages
 - Difference quotients
- Equations
 - Rational equations
 - Exponential equations
- Inequalities
 - Linear
 - Non-linear
- Radicals
- Functions
 - Function notation
 - Domain and range
 - Graphing
 - Linear functions
 - Polynomial and rational functions
 - Exponential and log functions
- Systems of linear equations
- Problem solving strategies

Total Hours: 45