Glendale College

Course Outline of Record Report

Course ID 003248

Revision - May 2023

MATH105 : Multivariable and Vector Calculus

General Information

Author:	• Suzanne Palermo
Course Code (CB01) :	MATH105
Course Title (CB02) :	Multivariable and Vector Calculus
Department:	MATH
Proposal Start:	Fall 2023
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) :	CCC000574304
Curriculum Committee Approval Date:	05/10/2023
Board of Trustees Approval Date:	
Last Cyclical Review Date:	02/01/2020
Course Description and Course Note:	MATH 105 is a course in vector calculus. Topics covered include vector functions, vector differentiation, parametric equations, vectors in two, three, and higher dimensional space, multiple integration, and an introduction to vector analysis including divergence, curl, Green's and Stokes' Theorems.
Justification:	Coding/Category Change
Academic Career:	• Credit
Author:	• Suzanne Palermo

Academic Senate Discipline

Primary Discipline:	• Mathematics

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	09/09/1991	No Comparable Course defined.

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

C-ID	Area	Status	Approval Date	Comparable Course
MATH	Mathematics	Approved	02/16/2010	MATH 230 - Multivariable Calculus

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
Lecture Hours	5	10
Laboratory Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	0
Course In-Class (Contact) Hours	

Studio Hours	0	0

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

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

Prerequisite

MATH104E - Calculus and Analytic Geometry II

Objectives

- evaluate definite and indefinite integrals using a variety of techniques, including integration by parts, trigonometric substitution, and partial fractions;
- evaluate improper integrals;
- solve separable differential equations;
- work with exponential and logistic models of growth and decay;
- graph conic sections;
- determine divergence or convergence of infinite sequences and series by applying convergence tests;
- differentiate and integrate power series;
- find Taylor and Maclaurin series for a function.
- graph equations in polar and parametric form;
- model differential equations;

OR

Prerequisite

MATH104EH - Honors Calculus and Analytic Geometry II

Objectives

- evaluate definite and indefinite integrals using a variety of techniques, including integration by parts, trigonometric substitution, and partial fractions;
- evaluate improper integrals;
- model differential equations;
- solve separable differential equations;
- work with exponential and logistic models of growth and decay;
- graph equations in polar and parametric form;
- graph conic sections
- determine divergence or convergence of infinite sequences and series by applying convergence tests;
- differentiate and integrate power series;
- find Taylor and Maclaurin series for a function.

OR

Entry Standards

Entry Standards

No value

Specifications

Methods of Instruction

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

Out of Class Assignments

- Homework (e.g. problem sets related to course content);
- Assignments and projects (e.g. prove a theorem stated in the textbook and present the proof to the instructor).

Methods of Evaluation	Rationale
Exam/Quiz/Test	Quizzes;
Exam/Quiz/Test	Three to six chapter examinations are required;
Exam/Quiz/Test	A comprehensive final examination is required.

Textbooks

Author	Title	Publisher	Date	ISBN
Briggs, William	Calculus Early Transcendentals	Pearson	2019	0-13-476364-5

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

Description	Vector Calculus
Author	Corall, Michael
Citation	No value
Online Resource(s)	No value

Learning Outcomes and Objectives

Course Objectives

apply the vector dot and cross products to determine equations of lines and planes;

find the limit of a function at a point;

determine differentiability and differentiate functions of two or more variables;

determine the equation of a tangent plane at a point;

optimize functions of two or more variables, both constrained and non-constrained, including testing for saddle points;

solve constraint problems using Lagrange multipliers;

compute arc length;

calculate two and three dimensional integrals in various coordinate systems (polar, rectangular, spherical, and cylindrical);

find the divergence and curl of a vector field;

perform basic vector algebra operations;

apply vector field theorems (Green's, Stokes', and Divergence) to solve problems in vector analysis

SLOs

Analyze problems related to points, lines, planes, and equations by applying vector operations, derivatives, partial derivatives, multiple integration, and change of coordinates.

Expected Outcome Performance: 70.0

MATH Mathematics - A.A. Degree Major	Evaluate limits, derivatives and integrals.
	solve a variety of rudimentary and second order differential equations.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
ILOs General Education	apply techniques of analysis and critical thinking to critique real world and theoretical topics and issues
MATH Mathematics - A.S. Degree Major	evaluate limits, derivatives and integrals.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
MATH Mathematics - AS-T	evaluate limits, derivatives and integrals.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.

Apply potential functions, Green's Theorem, Stokes' Theorem, and the Divergence Theorem in solving line and surface integrals and applications.

Expected Outcome Performance: 70.0

MATH Mathematics - A.A. Degree Major	Evaluate limits, derivatives and integrals.
	solve a variety of rudimentary and second order differential equations.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
ILOs General Education	apply techniques of analysis and critical thinking to critique real world and theoretical topics and issues
MATH Mathematics - A.S. Degree Major	evaluate limits, derivatives and integrals.
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MATH Mathematics - AS-T	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

Three-Dimensional Analytic Geometry and Vectors (25)

- Two, three and higher-dimensional coordinate systems
- Vectors and basic vector operations in two or more dimensions
- The dot product and projections
- The cross product and triple product
- Equations of lines and planes in rectangular, vector, and parametric forms
- Quadratic surfaces
- Vector functions and space curves
- Differentiability and derivatives of vector functions
- Tangent, normal and binormal vectors
- Tangent lines and planes for vector functions Integrals of vector functions
- Arc length and curvature
- Motion in space: Velocity and acceleration
- Cylindrical and spherical coordinates

Partials Derivatives (20)

- Real valued functions of two or more variables
- Level curves and surfaces
- Limits, continuity, and properties of limits and continuity
- Differentiability and partial derivatives
- Tangent lines and planes, and differentials
- The chain rule
- Higher order derivatives
- Directional derivatives and the gradient vector
- Local and global maxima and minima extrema, saddle points, and
- Lagrange multipliers

Multiple Integrals (19)

- Double integrals over rectangles Iterated integrals
- Double integrals over general regions
- Double integrals in polar coordinates
- Surface area
- Triple integrals in rectangular, cylindrical and spherical coordinates
- Change of variables in multiple integrals and the Jacobian Applications of double and triple integrals, including area, volume, center of mass, moment of inertia

Vector Calculus (26)

- Vector fields Gradient fields and conservative fields
- Line integrals
- The fundamental theorem for line integrals
- Green's Theorem Curl and divergence of vector fields
- Parametric Surfaces and their areas Integrals of real-valued functions over surfaces; surface integrals
- Stokes' theorem The divergence theorem

Total Hours = 90