

MATH114 : Calculus for Life Sciences II

General Information

Author:	<ul style="list-style-type: none">Suzanne PalermoDemirchyan, Gevork
Course Code (CB01) :	MATH114
Course Title (CB02) :	Calculus for Life Sciences II
Department:	MATH
Proposal Start:	Fall 2025
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) :	CCC000651646
Curriculum Committee Approval Date:	11/27/2024
Board of Trustees Approval Date:	01/21/2025
Last Cyclical Review Date:	11/27/2024
Course Description and Course Note:	<p>MATH 114 is the second semester of an applied calculus course sequence for biological and other life sciences. Students are introduced to techniques of integration, differential equations, applications of calculus in probability, and elements of multivariable calculus and linear algebra.</p>
Justification:	<p>New Course</p> <p>Creating a life science calculus course at our college is a strategic move to stay competitive and meet the growing demand for such programs. Nearby colleges, including LA Mission College, Pasadena City College, and many others, already offer these courses. By introducing our own, we ensure that our students have access to similar opportunities without needing to look elsewhere. Additionally, this course will articulate to many University of California (UC) campuses, including UCLA, and many California State University (CSU) campuses, such as Northridge and LA. Following AB1705, these courses offer a more targeted and less intensive option for students who don't require the STEM calculus sequence. This alignment not only enhances our curriculum but also supports our students' academic and career aspirations by facilitating their transfer to top-tier universities.</p>
Academic Career:	<ul style="list-style-type: none">Credit
Mode of Delivery:	<ul style="list-style-type: none">In-PersonRemoteHybridProctored Online
Author:	<ul style="list-style-type: none">Demirchyan, Gevork
Course Family:	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)

No value

Grading Basis

- Grade with Pass / No-Pass Option

Course Support Course Status (CB26)

Course is not a support course

General Education and C-ID

General Education Status (CB25)

GE Status (CSU) B4, (UC) 2

Transferability

Transferable to both UC and CSU

Transferability Status

Pending

Cal-GETC

Area 2: Mathematical Concepts and Quantitative Reasoning

Area

Mathematical Concepts and Quantitative Reasoning

Status

Pending

Approval Date

No value

Comparable Course

No Comparable Course defined.

GCC General Education Requirements

Area 2:

Area

Mathematical Concepts and Quantitative Reasoning

Status

Pending

Approval Date

No value

Comparable Course

No Comparable Course defined.

Units and Hours

Summary

Minimum Credit Units (CB07) 3.5

Maximum Credit Units (CB06) 3.5

Total Course In-Class (Contact Hours) 90

Total Course Out-of-Class Hours 108

Total Student Learning Hours 198

Credit / Non-Credit Options

Course Type (CB04) Credit - Degree Applicable	Noncredit Course Category (CB22) Credit Course.	Noncredit Special Characteristics No Value
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Course Classification Code (CB11) Credit Course. <input type="checkbox"/> Variable Credit Course	Funding Agency Category (CB23) Not Applicable.	<input type="checkbox"/> Cooperative Work Experience Education Status (CB10)
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Weekly Student Hours

	In Class	Out of Class
Lecture Hours	3	6
Laboratory Hours	2	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	
Lecture	54
Laboratory	36
Studio	0
Total	90
Course Out-of-Class Hours	
Lecture	108
Laboratory	0
Studio	0
Total	108

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

Prerequisites, Corequisites, Recommended Corequisites, and Recommended Preparation

Prerequisite

MATH113 - Calculus for Life Sciences I (in-development)

Objectives

- Perform mathematical modeling with functions, including linear, exponential, logarithmic, periodic, inverse functions, and sequences.
- Study continuity of a function at a given real number.
- Calculate derivatives using the limit definition as well as using the rules of differentiation for algebraic and transcendental functions.
- Interpret the derivative as a rate of change and as a slope of the tangent line.
- Evaluate limits of indeterminate forms using L'Hôpital's Rule.
- Calculate areas and definite integrals.

Entry Standards

Entry Standards	Description
No value	No value

Course Limitations

Cross Listed or Equivalent Course	Description
No value	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				
<ul style="list-style-type: none"> • 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	Quizzes			
Exam/Quiz/Test	Four or more chapter examinations are required			
Exam/Quiz/Test	A comprehensive final examination			
Textbook Rationale				
The Biocalculus text is the most recent version with all; the necessary concepts covered in the course.				
Textbooks				
Author	Title	Publisher	Date	ISBN
James Stewart, Troy Day	Biocalculus: Calculus, Probability, and Statistics for the Life Sciences	Cengage Learning	2015	9781305114036
Other Instructional Materials (i.e. OER, handouts)				
Description	Openstax Precalculus			
Author	Jay Abramson			

Citation

ISBN: 9781711493992

Online Resource(s)

No value

Learning Outcomes

Course Objectives

Evaluate definite and indefinite integrals using a variety of integration formulas and techniques.

Use integration to solve applications.

Model applications and solve them with linear and nonlinear differential equations.

Use calculus techniques to study probabilities on continuous variables.

Differentiate, integrate, and analyze functions of multiple variables.

Perform operations on matrices and vectors.

Compute eigenvalues and eigenvectors.

Solving linear and non-linear differential equations.

Construct and evaluate mathematical models for life science applications using integration methods.

Analyze existing dynamic models for feasibility using statistical software.

Apply technology to contextualize calculus skills learned for life science applications.

Analyze real life data using technology.

SLOs

Understand and explain applications of integration techniques.

Expected Outcome Performance: 70.0

Develop mathematical models of real-world situations and explain the assumptions and limitations of those models.

Expected Outcome Performance: 70.0

Use models to make predictions, draw conclusions, check whether the results are reasonable, and find optimal results using technology when necessary and appropriate.

Expected Outcome Performance: 70.0

Course Content

Lecture Content

Additional Techniques of Integration (14 hours)

- Integration by parts
- Partial fractions
- Numerical integration
- Applications of integration

Introduction to Differential Equations and Modeling with Application (13 hours)

- Solutions and separable equations
- Linear models in biology
- Slope fields and Euler's method
- Phase lines and classifying equilibria
- Bifurcation preview of modeling and calculus

Probabilistic Application of Integration (12 hours)

- Histograms,
- Probability density functions
- Cumulative density functions
- Improper integrals
- Mean and variance
- Bell-shaped distributions

Introduction to Multivariable Extensions (15 hours)

- Multivariate modeling
- Matrices and vectors
- Eigenvalues and eigenvectors
- Systems of linear differential equations
- Non-linear systems
- Partial derivatives
- Maxima & minima in several variables
- Directional derivatives & the gradient vector
- Double integrals

Total hours: 54

Laboratory/Studio Content

Additional Techniques of Integration (9 hours)

- Integration by parts
- Partial fractions
- Numerical integration
- Applications of integration

Introduction to Differential Equations and Modeling with Application (9 hours)

- Solutions and separable equations
- Linear models in biology
- Slope fields and Euler's method
- Phase lines and classifying equilibria
- Bifurcation preview of modeling and calculus

Probabilistic Application of Integration (6 hours)

- Histograms,
- Probability density functions
- Cumulative density functions
- Improper integrals

- Mean and variance
- Bell-shaped distributions

Introduction to Multivariable Extensions (12 hours)

- Multivariate modeling
- Matrices and vectors
- Eigenvalues and eigenvectors
- Systems of linear differential equations
- Non-linear systems
- Partial derivatives
- Maxima & minima in several variables
- Directional derivatives & the gradient vector
- Double integrals

Total hours: 36

Additional Information

Repeatability

Not Repeatable

Justification (if repeatable was chosen above)

No Value

Is it possible this course will have a material fee?

No Value

I have contacted my library liaison (<https://campusguides.glendale.edu/faculty/liasons>):

No Value

What term(s) will this course be offered?

No Value

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

No Value

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

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