MATH104EH : Honors Calculus and Analytic Geometry II

General Information

Author:	• Suzanne Palermo
Course Code (CB01) :	MATH104EH
Course Title (CB02) :	Honors Calculus and Analytic Geometry II
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) :	CCC000591643
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 104EH is a study of techniques of integration, indeterminate forms, applications of integration, differential equations, the calculus of parametric equations, polar coordinates, and conic sections, and the study of infinite sequences and series. The honors section of this course features more theory and proof, and one or more projects related to the topics of the course.
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	08/27/2018	MATH 220 - Single Variable Calculus II 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	54
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

MATH103E - Calculus & Analytic Geometry I (in-development)

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.
- Use the derivative for rate of change problems.
- Compute derivatives using differentiation formulas: constants, power rule, product rule, quotient rule and chain rule. Calculate higher order derivatives.
- 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.
- Use the Mean Value Theorem.
- Evaluate a definite integral as a limit of Riemann sums.
- Use substitution to integrate.
- Apply l'Hospital's rule to find limits of indeterminate forms.
- Differentiate inverse trigonometric functions.

OR

Prerequisite

MATH103EH - Honors Calculus and Analytic Geometry I (in-development)

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.
- Use the derivative for rate of change problems.
- Compute derivatives using differentiation formulas: constants, power rule, product rule, quotient rule and chain rule. Calculate higher order derivatives.

- 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.
- Use the Mean Value Theorem.
- Evaluate a definite integral as a limit of Riemann sums.
- Use substitution to integrate.
- Apply l'Hospital's rule to find limits of indeterminate forms.
- Differentiate inverse trigonometric functions.

OR

Prerequisite

MATH103E+ - Calculus and Analytic Geometry I with Support

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.
- Use the derivative for rate of change problems.
- Compute derivatives using differentiation formulas: constants, power rule, product rule, quotient rule and chain rule. Calculate higher order derivatives.
- 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.
- Use the Mean Value Theorem.
- Evaluate a definite integral as a limit of Riemann sums.
- Use substitution to integrate.
- Apply l'Hospital's rule to find limits of indeterminate forms.
- Differentiate inverse trigonometric functions.

Entry Standards

Entry Standards

Course Limitations

Cross Listed or Equivalent Course

MATH 104E - Calculus and Analytic Geometry II

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 project to solve a “challenging” application problem from the textbook)
- Honors enhancement: Individual or group reports and/or presentations (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	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, Cochran, Gillett, and Schulz	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

Determine the area between curves ,the average value and arc length of a function.

Determine the volumes of solids of revolution using the disk method, the cylindrical shell method, and the cross-section method.

Determine work done in applications involving liquids and springs.

Evaluate definite and indefinite integrals using a variety of techniques, including integration by parts, trigonometric substitution, and partial fractions.

Evaluate improper integrals.

Find approximations to definite integrals using midpoint, trapezoidal and Simpson techniques.

Model differential equations.

Solve separable differential equations.

Work with exponential and logistic models of growth and decay.

Graph equations in polar and parametric form.

Differentiate and integrate polar and parametric functions.

Graph conic sections.

Determine divergence or convergence of infinite sequences and series by applying convergence tests.

Represent functions as power series and determine their radius and interval of convergence.

Differentiate and integrate power series.

Find Taylor and Maclaurin series for a function.

SLOs

Evaluate the limits of indeterminate forms, derivatives, integrals, and the convergence/divergence of sequences and series.

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.

MATH Mathematics A.S. Degree	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
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.

Solve application problems using the methods of integration, parametric equations, polar coordinates, and properties of power series.

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.
MATH Mathematics A.S. Degree	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
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.

Course Content

Lecture Content

Applications of Integration (16 hours)

- Applications of integration to areas and volumes
- Areas between curves
- Volume or a solid of revolution
- Volume of solids of known cross section
- Work
- Average value of a function

Techniques of Integration (16 hours)

- Integration by parts
- Trigonometric integrals
- Trigonometric substitution
- Integration of rational functions by partial functions
- Strategy for integration
- Numerical integration, including midpoint, trapezoidal, and Simpson's rules
- Improper integrals

Further Applications of Integration (11 hours)

- Arc length
- Area of a surface of revolution
- Hydrostatic pressure and force
- Differential Equations
- Modeling with Differential Equations
- Separable Differential Equations
- Exponential Growth and Decay
- Logistic Equations

Parametric Equations and Polar Coordinates (16 hours)

- Curves defines by parametric equations
- Calculus with Parametric Curves
- Polar coordinates
- Areas and lengths in polar coordinates
- Conic sections
- Conic sections in polar coordinates

Infinite Sequences and Series (22 hours)

- Sequences
- Series
- The integral test
- The comparison tests
- Alternating series
- Absolute convergence and the ratio and root tests
- Strategy for testing series
- Power series including radius and interval of convergence
- Representation of functions and power series
- Taylor and Maclaurin series
- The binomial series
- Applications of Taylor polynomials

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