Calculus I Mathematics

Description

This course is the first in the calculus sequence designed for the engineering, science, or mathematics major. Topics include functions and limits, techniques and applications of differentiation, indefinite and definite integrals, and applications of integration.

Minimum Contact Hours

56

Prerequisite(s)

Precalculus with Trigonometry

Corequisite(s)

None

Topics

<table>
<thead>
<tr>
<th>Title</th>
<th>Hours</th>
<th>Description</th>
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<tbody>
<tr>
<td>Extreme Function Values and Techniques of Graphing</td>
<td>8</td>
<td>Applying Rolle's Theorem and the Mean Value Theorem; using derivatives to determine when a function is increasing or decreasing, to locate relative extrema to determine concavity and points of inflection; sketching graphs using calculus techniques; solving applied problems using the concepts of extrema; using derivatives to determine the velocity and acceleration of objects traveling along linear paths.</td>
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<tr>
<td>Functions, Limits, and Continuity</td>
<td>9</td>
<td>Relationship between the derivative of a function and the derivative of the function’s inverse; derivatives of the inverse trigonometric functions; integrating functions whose antiderivatives are inverse trigonometric functions; evaluating definite and indefinite integrals yielding inverse trigonometric functions; applying the derivatives of inverse trigonometric functions and integrals yielding inverse trigonometric functions to geometrical and physical problems.</td>
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The Definite Integral and Integration 10
Using summation notation with properties and rules; evaluating antiderivatives using basic theorems and substitution techniques; calculating the definite integral and the area under a curve as the limit of a Riemann sum; using the Fundamental Theorem of Calculus; applying the properties of the definite integral when evaluating an integral; Mean Value Theorem for Integrals; solving differential equations involving the separation of variables; estimating the value of definite integrals.

The Derivative and Differentiation 10
Definition of derivative; calculating derivatives using limit definition; calculating instantaneous rates of change; applying the power rule, the scalar multiple rule, the sum rule, the product rule, and the quotient rule to find the derivative; using the chain and power rules for differentiating; calculating second-, third-, and higher-order derivatives; implicit differentiation; solving related rate problems.

Transcendental Functions 10
Natural logarithmic function and its properties; calculating derivative of logarithmic functions; applying logarithmic differentiation; the derivative of exponential functions; integration formulas for exponential functions; derivatives of trigonometric functions; integrating trigonometric functions.

Course Objectives

Lifelong Learning
An ability to engage in continuous learning as well as research and assess new ideas and information to provide the capabilities for lifelong learning.

- **Learning Outcomes**
  - CS. 6.
    - Apply fundamental theorems and rules of Calculus to differentiate and integrate algebraic, trigonometric, inverse trigonometric and transcendental functions.
  - CS. 7.
    - Apply fundamental theorems and rules of Calculus to evaluate limits and analyze the continuity of various functions.
  - CS. 8.
    - Apply fundamental theorems and rules of differentiation to solve problems that model real-world situations.
  - CS. 16.
    - Construct symbolic models of applied problems described in words.
  - CS. 31.
    - Use fundamental concepts of Calculus to construct graphs of polynomial, rational and exponential functions.

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