Course Overview

Content Area: **Mathematics**
Course(s): **AP Calculus BC**
Time Period: **Year**
Length: **180**
Status: **Published**

Course Overview

Aligned to Standards: College Board

Revision Date: 2023

In compliance with the NJ Student Learning Standards, climate change, career readiness, DEI (Diversity, Equity, & Inclusivity), as well as other standards have been integrated within the NBCRSD curricula (NJ Administrative Code Title 6A: chapter 8; Title 18A: chapter 35).

Course Overview

Sequence- Unit Titles, Summaries, and Number of weeks per unit (total = 18 semester/36 year)

Unit 1: Limits and Continuity - 2 weeks

In this unit, students will understand that limits introduce the subtle distinction between evaluating a function at a point and considering what value the function is approaching, if any, as x approaches a point. This distinction allows us to extend understanding of asymptotes and holes in graphs with formal definitions of continuity. Consider reviewing rational functions when introducing limits, rather than beginning the year with a full review of precalculus topics. Limits are the foundation for differentiation, integration, and infinite series (bc only. They are the basis for important definitions and for theorems that are used to solve realistic problems involving change and to justify conclusions.

Unit 2: Derivatives - 2 weeks

In this unit, students will understand that derivatives allow us to determine instantaneous rates of change. To develop understanding of how the definition of the derivative applies limits to average rates of change, students will have opportunities to explore average rates of change over increasingly small intervals. Graphing calculator explorations of how various operations affect slopes of tangent lines help students to make sense of basic rules and properties of differentiation. Students are encouraged to apply the order of operations as they select differentiation rules. Developing differentiation skills will allow students to model realistic instantaneous rates of change.

Unit 3: Applications of Derivatives - 3 weeks

In this unit, students develop understanding of average and instantaneous rates of change in problems involving motion. The unit then identifies differentiation as a common underlying

structure on which to build understanding of change in a variety of contexts. Students' understanding of units of measure often reinforces their understanding of contextual applications of differentiation. In problems involving related rates, identifying the independent variable common to related functions will help students to correctly apply the chain rule. When applying differentiation to determine limits of certain indeterminate forms using L'Hospital's rule, students must show that the rule applies.

Unit 4: Integration - 3 weeks

This unit enables students to establish the relationship between differentiation and integration using the Fundamental Theorem of Calculus. Students begin by exploring the contextual meaning of areas of certain regions bounded by rate functions. Integration determines accumulation of change over an interval, just as differentiation determines instantaneous rate of change at a point. Students understand that integration is a limiting case of a sum of products (areas) in the same way that differentiation is a limiting case of a quotient of differences (slopes). Future units will apply the idea of accumulation of change to a variety of realistic and geometric applications.

Unit 5: Differential Equations - 2 weeks

In this unit, students will set up and solve separable differential equations. Slope fields will be used to represent solution curves to a differential equation and build understanding that there are infinitely many general solutions to a differential equation, varying only by a constant of integration. Students will locate a unique solution relevant to a particular situation, provided they can locate a point on the solution curve. By writing and solving differential equations leading to models for exponential growth and decay

Unit 6: Applications of integrations - 2 weeks

This unit enables students to apply advanced techniques for antidifferentiation to model real life situations. Lessons include finding the total change of a function given a rate of change, determining the area between two functions, Volumes of Solids (Disk and Washer Methods), and curve length.

Unit 7: Advanced Integration Techniques - 3 weeks

Apply advanced techniques of integration to solve a variety of problems in different contexts. Methods include integration by parts, partial fractions and L'Hospital's Rule. Students also explore indeterminate forms other than 0/0 and infinity/infinity.

Unit 8: Infinite series - 6 weeks

In this Unit, students will understand that a sum of infinitely many terms may converge to a finite value. They can develop intuition by exploring graphs, tables, and symbolic expressions for series that converge and diverge and for Taylor polynomials. Students should build connections to past learning,

such as how evaluating improper integrals relates to the integral test or how using limiting cases of power series to represent continuous functions relates to differentiation and integration. Students who rely solely on memorizing a long list of tests and procedures typically find little success achieving a lasting conceptual understanding of series.

Unit 9: Parametrics, polars and vectors - 4 weeks

Students build on their understanding of straight-line motion to solve problems in which particles are moving along curves in the plane. Students will define parametric equations and vector-valued functions to describe planar motion and apply calculus to solve motion problems. Students will learn that polar equations are a special case of parametric equations and will apply calculus to analyze graphs and determine lengths and areas. This unit should be treated as an opportunity to reinforce past learning and transfer knowledge and skills to new situations, rather than as a new list of facts or strategies to memorize.

Reporting Student Progress (link to NB's Assessment System)
All courses follow a balanced assessment system with Practice and Assessments.
Each category includes formative, summative and alternative assessments.

Accommodations and Modifications (link to menu)
Integrated accommodations and modifications for special education students, English language learners, students at risk of school failure, gifted and talented students, and students with 504 plans.