Year Long Course Plan

Department: Mathematics **Course: AP Calculus 464-465**

Essential Learning Outcomes: After successfully completing this course, students will be able to:

1. Identify, describe, and analyze properties of functions and the relationships among functions
2. Use models to solve mathematical and real-world problems
3. Use technology to plot graphs of functions, determine zeros of a function, determine the derivative of a function at a point and find the value of a definite integral
4. To be able to solve problems graphically, numerically, analytically and verbally and to determine when each method is most appropriate.
5. Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly
6. Use reason and logic to evaluate information, perceive patterns, identify relationships, formulate questions, pose problems, and make and test conjectures
7. Demonstrate an understanding of the interrelationship among mathematics, physics, economics and the social sciences
8. Analyze non-routine problems and arrive at solutions by various means
9. Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data

Quarter 1	*Quarter 2*
Unit 1: Introduction **(ELO 2,4,5,6,7)** • **Instantaneous rates of change of function** • **Instantaneous rates of change at a point** • **Limits of indeterminant forms of a function at a point** • **ASSESSMENT: Written Test** **Unit 2: Library of Functions** **(ELO 1,2,4,5,6,7)** • **Functions and change** • **Exponential functions** • **Translations of functions** • **Logarithmic functions** • **Trigonometric functions** • **Powers, polynomials, and rational functions** • **Introduction to continuity** • **Limits** • **ASSESSMENT: Written Test** **Unit 3: Key Concept: The Derivative** **(ELO 1,2,3,4,5,6,7,9)** • **Average and instantaneous velocity** • **Derivative at a point** • **The derivative function** • **Interpretations of the derivative** • **The second derivative** • **Differentiability** • **ASSESSMENT: Written Test**	**Unit 5: More Short- cuts to Differentiation** **(ELO 1,2,3,4,5,6,7,8)** • **The chain rule and inverse functions** • **Implicit functions** • **Linear approximations and the derivative** • **Mean value theorem** • **ASSESSMENT: Written Test** **Unit 6: Using the Derivative** **(ELO 1,2,3,4,5,6,7,8,9)** • **Using the first and second derivative** • **Families of curves** • **Optimization: global and local** • **Optimization and modeling** • **L'Hôpital's rule, growth and dominance** • **ASSESSMENT: Written Test** **Unit 7: Key Concept: The Definite Integral** **(ELO 1,2,3,4,5,6,7)** • **Distance traveled** • **The definite integral and Riemann sums** • **The fundamental theorem of calculus and interpretations** • **Properties of definite integrals and properties of limits of integration** • **ASSESSMENT: Written Test** **Unit8: Constructing Antiderivatives** **(ELO 1,2,3,4,5,6,7,8)** • **Antiderivatives graphically**

Unit 4: Short-cuts to Differentiation **(ELO 1,2,3,4,5,6,7)** • **Powers and polynomials** • **The exponential function** • **The product and quotient rules** • **The chain rule** • **The second derivative** • **The trigonometric functions** • **ASSESSMENT: Written Test**	• **Antidervatives numerically** • **Antiderivatives analytically** • **Differential equations** • **Second fundamental theorem of calculus ASSESSMENT: Written Test**
Quarter 3	***Quarter 4***
Unit 9: Integration **(ELO 2,3,4,5,6,7,8)** • **Integration by substitution** • **Approximating definite integrals** • **ASSESSMENT: Written Test** **Unit 10: Using the Definite Integral** **(ELO 2,3,4,5,6,7,8)** • **Areas between curves** • **Volumes by slicing** • **Volumes of solids of revolution** • **Volumes of solids with know cross sections** • **ASSESSMENT: Written Test** **Unit 11: Differential Equations** **(ELO 1,2,3,4,5,6,7,8,9)** • **Interpreting differential equations** • **Slope fields** • **Solving separable differential equations** • **Exponential growth and decay** • **ASSESSMENT: Written Test**	**Unit 12: AP Review** **(ELO 1,2,3,4,5,6,7,8,9)** • **Write review concept outline** • **Multiple choice -no calculator** • **Multiple choice - calculator** • **Multiple choice- derivatives** • **Multiple choice - integrals** • **Free response - no calculator** • **Free response - calculator** • **Free response - derivatives** • **Free response - integrals** • **ASSESSMENT: Review Presentation and Written Test** **Unit 13: Integration** **(ELO 2,3,4,5,6,7,8)** • **Integration by parts** • **ASSESSMENT: Written Test** **Unit 14: Problem Solving** **(ELO 2,4,5,6,7,8)** • **Applications** • **Mathematical puzzles** • **ASSESSMENT: Written Activities**