

Calculus SYLLABUS

COURSE DESCRIPTION:

Calculus is the study of change and motion through the use of limits, derivatives, and integrals. Building on concepts from Algebra, Geometry, and Precalculus, this course develops a deep understanding of how functions behave and how they can model real-world phenomena. Students will explore the concepts of continuity, rates of change, and accumulation through both analytical and graphical perspectives.

Emphasis is placed on conceptual understanding, algebraic manipulation, problem-solving, and applications across science, engineering, economics, and other disciplines. Students will also strengthen their mathematical communication by justifying results, interpreting graphical and numerical data, and connecting multiple representations of functions.

(Texas TEKS reference: [§111.43. Calculus](#))

COURSE OBJECTIVES:

Students will:

- Understand and apply the concept of a limit and use it to define continuity and differentiability.
- Compute derivatives of algebraic, trigonometric, exponential, and logarithmic functions.
- Apply derivatives to solve problems involving rates of change, motion, optimization, and curve analysis.
- Understand the relationship between differentiation and integration as inverse processes.
- Evaluate definite and indefinite integrals using multiple techniques, including substitution and numerical approximation.
- Use the Fundamental Theorem of Calculus to solve accumulation and area problems.
- Apply calculus concepts to model real-world situations and interpret results within context.
- Use graphing technology and symbolic reasoning to analyze and communicate solutions effectively.

COURSE OUTLINE:

Semester 1	Semester 2
<ul style="list-style-type: none">▪ Review of Functions and Limits▪ Limits and Continuity▪ Definition of Derivative▪ Differentiation Rules▪ Chain Rule... and Implicit Differentiation▪ Higher Order Derivatives▪ Applications to Area, Volume, Motion▪ Related Rates and Optimization	<ul style="list-style-type: none">▪ Curve Sketching and Motion Along a Line▪ Definite and Indefinite Integrals▪ Fundamental Theorem of Calculus▪ Techniques of Integration (subs, parts,...)▪ Area Between Curves▪ Volume of Solids▪ Differential Equations and Slope Fields