

# Information for Course Syllabus

Name of Course: Beyond AP Calculus (DE Linear Algebra, DE Multivariable Calculus, DE Differential Equations)

Grade Level: 11-12

School: ORHS

Major Assignments: None

Field Trips: None

How can parents access instructional materials? Canvas

# DE Linear Algebra

## 2021-2022

### Term 1

August	Unit 1: Linear Algebra	1.1 Systems of Linear Equations
		1.2 Row Reduction and Echelon Forms
		1.3 Vector Equations
		1.4 The Matrix Equation $Ax = b$
		1.5 Solution Sets of Linear Systems
		1.7 Linear Independence
		1.8 Introduction to Linear Transformations
		1.9 The Matrix of a Linear Transformation
	Unit 2: Matrix Algebra	2.1 Matrix Operations
		2.2 The Inverse of a Matrix
		2.3 Characterizations of Invertible Matrices
		2.5 Matrix Factorizations
	Unit 3: Determinants	3.1 Introduction to Determinants
		3.2 Properties of Determinants
		3.3 Cramer's Rule, Volume, and Linear Transformations

# DE Linear Algebra

## 2021-2022

### Term 1

<b>September</b>	<b>Unit 4: Vector Spaces</b>	4.1 Vector Spaces and Subspaces
		4.2 Null Spaces, Column Spaces, and Linear Transformations
		4.3 Linearly Independent Sets; Bases
		4.4 Coordinate Systems
		4.5 The Dimension of a Vector Space
		4.6 Rank
		4.7 Change of Basis
	<b>Unit 5: Eigenvalues &amp; Eigenvectors</b>	5.1 Eigenvectors and Eigenvalues
		5.2 The Characteristic Equation
		5.3 Diagonalization

**DE Linear Algebra  
2021-2022**

**Term 2**

<b>October</b>	<b>Unit 6: Orthogonality</b>	6.1 Inner Product, Length, and Orthogonality
		6.2 Orthogonal Sets
		6.3 Orthogonal Projections
		6.4 The Gram—Schmidt Process
		7.1 Diagonalization of Symmetric Matrices

# DE Multivariable Calculus

## 2021-2022

### Term 2

<b>November</b>	<b>Unit 1: Vectors and the Geometry of Space</b>	1.1 Three-Dimensional Coordinate Systems
		1.2 Vectors
		1.3 The Dot Product
		1.4 The Cross Product
		1.5 Equations of Lines and Planes
		1.6 Functions and Surfaces
		1.7 Cylindrical and Spherical Coordinates
	<b>Unit 2: Vector Functions</b>	2.1 Vector Functions and Space Curves
		2.2 Derivatives and Integrals of Vector Functions
		2.3 Arc Length and Curvature
		2.4 Motion in Space: Velocity and Acceleration
		2.5 Parametric Surfaces

<b>December</b>	<b>Unit 3: Partial Derivatives</b>	3.1 Functions of Several Variables
		3.2 Limits and Continuity
		3.3 Partial Derivatives

# DE Multivariable Calculus

## 2021-2022

### Term 3

<b>January</b>	<b>Unit 3: Partial Derivatives</b>	3.4 Tangent Planes and Linear Approximations
		3.5 The Chain Rule
		3.6 Directional Derivatives and the Gradient Vector
		3.7 Maximum and Minimum Values
		3.8 Lagrange Multipliers

<b>February</b>	<b>Unit 4: Multiple Integrals</b>	4.1 Double Integrals over Rectangles
		4.2 Iterated Integrals
		4.3 Double Integrals over General Regions
		4.4 Double Integrals in Polar Coordinates
		4.5 Applications of Double Integrals
		4.6 Surface Area
		4.7 Triple Integrals
		4.8 Triple Integrals in Cylindrical and Spherical Coordinates
		4.9 Change of Variables in Multiple Integrals

**DE Multivariable Calculus  
2021-2022**

**Term 3**

<b>March</b>	<b>Unit 5: Vector Calculus</b>	5.1 Vector Fields
		5.2 Line Integrals
		5.3 The Fundamental Theorem for Line Integrals
		5.4 Green's Theorem
		5.5 Curl and Divergence
		5.6 Surface Integrals
		5.7 Stokes' Theorem
		5.8 The Divergence Theorem

# DE Differential Equations

## 2021-2022

### Term 4

<b>March</b>	<b>Unit 1: First Order Differential Equations</b>	1.1 Introduction to Differential Equations
		1.2 First Order Linear Differential Equations
		1.3 Exact Equations
		1.4 Substitution and Transformation

<b>April</b>	<b>Unit 2: Second Order Differential Equations</b>	2.1 Homogeneous 2nd Order Differential Equations
		2.2 Nonhomogeneous 2nd Order Differential Equations Method of Variation of Parameters Method of Undetermined Coefficients
	<b>Unit 3: LaPlace Transforms</b>	3.1 LaPlace Transforms (Definition)
		3.2 Inverse LaPlace Transforms
		3.3 Solve a Differential Equation by LaPlace Transforms
		3.4 Solve a system of Differential Equations by LaPlace Transforms



# DE Differential Equations 2021-2022

## Term 4

<b>May</b>	<b>Unit 4: Power Series Solutions &amp; Diagonalization</b>	4.1 Taylor Series Solutions to Differential Equations
		4.2 Power Series Solutions to Differential Equations
		4.3 Diagonalization
	<b>Unit 5: Numerical Methods &amp; Maple</b>	5.1 Euler's Method
		5.2 Heun's Method
		5.3 Nystrom's Method
		5.4 Three-Term Taylor Series Method
		5.5 Runga-Kuta