# Liberty Common High School – Calculus III

SCHEDULE OF TOPICS: (subject to change at teacher's discretion and based on students' performance)

**Unit 1: Chapter 11 Vectors and the Geometry of Space** (approximately 21 days)
11.1 Vectors in 2D
11.2 Vectors in 3D
11.3 The Dot Product
11.4 The Cross Product
11.5 Lines and Planes in Space
11.6 Surfaces in Space
11.7 Cylindrical and Spherical Coordinates

**Unit 2: Chapter 12 Vector-Valued Functions** (approximately 18 days)
12.1 Vector-Valued Functions
12.2 Differentiation and Integration of Vector-Valued Functions
12.3 Velocity and Acceleration
12.4 Tangent Vectors and Normal Vectors
12.5 Arc Length and Curvature

**Unit 3: Chapter 13 Functions of Several Variables** (approximately 28 days)
13.1 Introduction to Functions of Several Variables
13.2 Limits and Continuity
13.3 Partial Derivatives
13.4 Differentials
13.5 Chain Rule for Functions of Several Variables
13.6 Directional Derivatives and Gradients
13.7 Tangent Planes and Normal Lines
13.8 Extrema of Functions of Two Variables
13.9 Applications of Extrema
13.10 Lagrange Multipliers

**Unit 4: Chapter 14 Multiple Integration** (approximately 28 days)
14.1 Iterated Integrals and Area in the Plane
14.2 Double Integrals and Volume
14.3 Change of Variables: Polar Coordinates
14.4 Center of Mass and Moments of Inertia
14.5 Surface Area
14.6 Triple Integrals and Applications
14.7 Triple Integrals in Other Coordinates
14.8 Change of Variables: Jacobians

**Unit 5: Chapter 15 Vector Analysis** (approximately 24 days)
15.1 Vector Fields
15.2 Line Integrals
15.3 Conservative Vector Fields and Independence of Path
15.4 Green's Theorem
15.5 Parametric Surfaces
15.6 Surface Integrals
15.7 Divergence Theorem
15.8 Stokes's Theorem

**Unit 6: (Optional) Chapter 16 Additional Topics In Differential Equations** (approximately 14 days if time allows)
16.1 Exact First-Order Equations
16.2 Second-Order Homogeneous Linear Equations
16.3 Second-Order Nonhomogeneous Linear Equations
16.4 Series Solutions of Differential Equations

**Unit 7: (Optional) Semester 1 and Semester 2 Projects** (approximately 11 days if time allows)
Semester 1 project: Student will present on a Calculus Application problem.
Semester 2 project: Student will research and present a project on an advanced topic such as: Differential Equations, Multiple Integrals, Surfaces in Space, or Vector Fields.

**Final** (approximately 2 days)
The final exam is mandatory. Not taking the final exam will result in a score of zero on the exam. The final is cumulative over the entire course.