The following list of topics is considered the core content for the course 110.211 Honors Multivariable Calculus. Requisite courses:

- Prerequisites: 110.108 Calculus I and 110.109 Calculus II, or equivalent to a full year of single variable calculus.
- Co-requisite: 110.201 Linear Algebra or equivalent.


Course Topics

- **Vectors and the geometry of Euclidean space (Assumed: 0 weeks)**
  - 1.1 Vectors in Two- and Three-Dimensions
  - 1.2 More About Vectors
  - 1.3 The Dot Product
  - 1.4 The Cross Product
  - 1.5 Equations for Planes, Distance Problems
  - 1.6 Some n-Dimensional Geometry
  - 1.7 New Coordinate Systems

- **Differentiation in Several Variables (3 weeks)**
  - 2.1 Functions of Several Variables; Graphing Surfaces
  - 2.2 Limits
  - 2.3 The Derivative
  - 2.4 Properties, Higher Order Partial Derivatives
  - 2.5 The Chain Rule
  - 2.6 Directional Derivatives and the Gradient

- **Vector-Valued Functions (2 weeks)**
  - 3.1 Parameterized Curves
  - 3.2 Arclength and Differential Geometry
  - 3.3 Vector Fields: An Introduction
  - 3.4 Gradient, Divergence, Curl, and the Del Operator

- **Maxima and Minima in Several Variables (1+ week)**
  - 4.1 Differentials and Taylor’s Theorem
  - 4.2 Extrema of Functions
  - 4.3 Lagrange Multipliers

- **Multiple Integration (1+ week)**
  - 5.1 Introduction; Areas and Volumes
  - 5.2 Double Integrals
  - 5.3 Changing the Order of Integration
  - 5.4 Triple Integrals
  - 5.5 Change of Variables
• **Line Integrals (1+ week)**
  o 6.1 Scalar and Vector Line Integrals
  o 6.2 Green’s Theorem
  o 6.3 Conservative Vector Fields

• **Surface Integrals and Vector Analysis (2- weeks)**
  o 7.1 Parameterized Surfaces
  o 7.2 Surface Integrals
  o 7.3 Stokes’ and Gauss’ Theorems
  o (Optional) 7.4 Further Vector Analysis: Maxwell’s Equations

• **Vector Analysis in Higher Dimensions (1+ week)**
  o 8.1 An Introduction to Differential Forms
  o 8.2 Manifolds and Integrals of k-Forms
  o 8.3 The Generalized Stokes’ Theorem