



**Catalog Description:**

Multivariable calculus treated in depth.

**Prerequisite:**

C or better in 1181H or 4181H.

**Exclusions:**

Not open to students with credit for both 162.01H and 263.01H

**Text:**

*Calculus with Analytic Geometry*, 2nd Edition, by George F. Simmons, published by McGraw-Hill, ISBN: 0070576424

**Topics List:**

- 15.1; 15.2 Conic sections: Ellipse, Parabola, Hyperbola
- 15.3; 15.4 Conic sections: Ellipse, Parabola, Hyperbola
- 16.1 Polar coordinate system
- 16.2 Graphs of polar equations
- 16.3 Polar Equations of conics and spirals
- 16.3; 16.4 Polar Equations of conics and spirals; Arc length and tangent lines
- 16.5 Areas in polar coordinates
- 17.1 Parametric Equations of Curves
- 17.2 Cycloids and other similar Figures
- 17.3 Vector Algebra, the Unit Vectors  $i$  and  $j$ ;
- 17.4 Derivatives of Vector Functions, Velocity and Acceleration
- 17.5 Curvature and the Unit Normal Vector
- 17.6 Tangential and Normal Components of Acceleration
- 17.7 Kepler's Laws and Newton's Law of Universal Gravitation

*Midterm 1*



- 18.1 Coordinates and Vectors in 3-D Space
- 18.2 The Cross Product of Two Vectors
- 18.3 The Dot Product of Two Vectors
- 18.4 Lines and Planes
- 18.5 Cylinders and Surfaces of Revolution
- 18.6 Quadratic Surfaces;
- 18.7 Cylindrical and Spherical Coordinates
- 19.1 Function of Several Variables
- 19.2 Partial Derivatives
- 19.3 The Plane Tangent to a Surface
- 19.4 Increments and Differentials, the Fundamental Lemma
- 19.5 Directional Derivatives and the Gradient
- 19.6 The Chain Rule for Partial Derivatives
- 19.7; 19.8 Maximum and Minimum Problems
- 19.10 Implicit Functions

*Midterm 2*

- 20.1 Volumes as Iterated Integrals
- 20.2 Double Integrals and Iterated Integrals
- 20.3 Physical Applications of Double Integrals
- 20.4 Double Integrals in Polar Coordinates
- 20.5 Triple Integrals
- 20.6 Cylindrical Coordinates
- 20.7 Spherical Coordinates, Gravitational Attraction
- 20.8 Area of Curved Surfaces

*Midterm 3*

- 21.1 Line Integrals in the Plane
- 21.2 Independence of Path, Conservative Fields
- 21.3 Green's Theorem
- 21.4 Surface Integrals and Gauss' Theorem
- 21.5 Stokes' Theorem