Course number and name
Math21a Multivariable Calculus, Harvard College/GSAS: 6760

Credits and contact hours
Half course. Mon, Wed., Fri. 9-10 am, 10-11am , 11-12 am, Tue-Thu 10-11:30, 11:30-1

Instructor’s or course coordinator’s name
Oliver Knill

Text book, title, author, and year
Recommended Textbook: Stewart or equivalent

Other supplemental materials
Handouts, homework on course website

Specific course information
a. Brief description of the content of the course (catalog description)
   To see how calculus applies in practical situations described by more than one variable, we study: Vectors, lines, planes, parameterization of curves and surfaces, partial derivatives, directional derivatives and the gradient, optimization and critical point analysis, including constrained optimization and the Method of Lagrange Multipliers, integration over curves, surfaces and solid regions using Cartesian, polar, cylindrical, and spherical coordinates, divergence and curl of vector fields, and the Green's, Stokes's, and Divergence Theorems.

Prerequisites or co-requisites
Single variable Calculus, Math 1b or equivalent

b. Required, elective, or selective elective

Specific goals for the course
a. Specific outcomes of instruction
   By the end of the course, students should be able to:
   
   Think geometrically, visualize surfaces, curves, vector fields
   Extremization problems in higher dimensions with or without constraints
   Integrate and differentiate in higher dimensions
   Use integral theorems to solve problems,
   Be able to deal with more advanced mathematics
b. ABET outcomes in Criterion 3

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Brief list of topics to be covered

Vector Geometry
- Dot product, cross product, triple scalar product
- Compute area, volume and length, distances
Curves and Surfaces
- Parametrization of curves and surfaces
- Differentiation in higher dimensions: curl, grad and div
- Extrema with or without constraints
Integration in two and three dimensions
Vector fields
- Fundamental theorem of line integrals
- Greens theorem
- Stokes theorem
- Divergence theorem