

Multivariable Calculus TCSU MATH 230

A. Description

Vector valued functions, calculus of functions of more than one variable, partial derivatives, multiple integration, Green's Theorem, Stoke's Theorem, divergence theorem.

B. Recommended Preparation

C. Prerequisites

One year of Single Variable Calculus

D. Minimum Unit Requirement

4 semester units

E. Course Topics

1. Vectors in two and three dimensions
2. Vector addition, scalar multiplication, standard basis vectors
3. Vector equation of a line, parametric equation of a line
4. Dot (inner) product, Cauchy-Schwarz Inequality, projection
5. Cross product, matrices, determinant (2×2 , 3×3), triple product
6. Vector equation of a plane, rectangular equation of a plane
7. Functions of several variables, real-valued functions
8. Level sets, curves, and surfaces
9. Limit, properties of limits
10. Continuity, properties of continuous functions
11. Partial derivatives
12. Differentiability
13. Gradient ($\text{grad } f$)
14. Curves, tangent vector
15. Properties of derivatives
16. Chain rule
17. Gradients, directional derivatives, gradient vector field
18. Higher-order derivatives
19. Local maxima and minima, saddle point
20. Global maxima and minima
21. Lagrange multipliers
22. Vector-valued functions
23. Arc length
24. Vector fields
25. Divergence and Curl
26. Double and triple integrals
27. Change of variables theorem, Jacobian

28. Integrals in polar, cylindrical, and spherical coordinates
29. Integrals over paths and surfaces
30. Line integrals
31. Integrals of real-valued functions over surfaces
32. Green's Theorem
33. Stoke's Theorem
34. Conservative fields
35. Divergence theorem

F. Student Learning Outcomes

Upon successful completion of the course, students will be able to:

1. Compute vector operations;
2. Determine equations of lines and planes;
3. Compute the limit of a function at a point;
4. Compute derivatives;
5. Compute the equation of a tangent plane at a point;
6. Determine differentiability ;
7. Determine and test for local extrema, saddle points;
8. Solve constraint problems using Lagrange multipliers;
9. Compute arc length;
10. Compute the divergence and curl of a vector field;
11. Evaluate two and three dimensional integrals;
12. Apply Green's Theorem;
13. Apply Stoke's Theorem; and
14. Apply the divergence theorem