SECTION HEADING

MATH 2201: Calculus III

Description

Calculus III extends applications of derivatives and integrals to three-dimensions, this course continues Calculus II. Topics include vectors, vector-valued functions with applications, functions of two or more variables, partial derivatives, multiple integrals, and vector analysis topics including line and surface integrals, Green's Theorem, the Divergence Theorem, and Stoke's Theorem.

Credits

4

Prerequisite

MATH 1122

Corequisite

None

Topics to be Covered

1. Three Dimensional Coordinate systems and vector definitions

2. Vector Dot and Cross Products

3. Equations of lines, plane and surfaces (function approach).

4. Cylindrical and Spherical coordinates.

5. Vector Functions and space curves

6. Derivatives and Integrals of Vector Functions.

7. Arc Length, Curvature and Motion in Space.

8. Parametric Surfaces

9. Functions of several variables

10. Limits, Continuity, and Partial derivatives

11. Tangent Planes and Linear Approximations

12. Chain Rule for many variables

13. Directional Derivatives and the Gradient vector

14. Maxima, Minima, and Saddle Points

15. Lagrange Multipliers

16. Double Integrals over Rectangles and over General regions

17. Maxima, Minima, and Saddle Points

18. Lagrange Multipliers

19. Double Integrals over Rectangles and over General regions

20. Iterated integrals

21. Double Integrals in Polar Coordinates

22. Surface Area and other applications of double integrals

23. Triple Integrals and their applications

24. Changing Variables in Multiple Integrals

25. Vector Fields and Line Integrals

26. Green's Theorem

27. Curl and Divergence and Surface Integrals

28. Stoke's Theorem

29. Divergence Theorem

Learning Outcomes

1. Explain the concepts of limits and continuity for real-valued functions of two or more variables.

2. Find derivatives of vector-valued functions and use those derivatives to describe an object's motion.

3. Use partial derivatives and/or Lagrange multipliers to locate any extreme values and saddle points of a function of several variables.

4. Evaluate iterated integrals using rectangular, cylindrical, and spherical coordinate systems.

5. Use triple integrals to solve problems such as calculating volume, center of mass, moments of inertia, and the expected value of a continuous random variable.

6. Recognize vector fields. Compute and interpret curl, divergence, and flux.

7. Use line integrals to calculate work done by a force field in moving an object along a curve.

8. State and apply the Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem.

9. Compare and contrast the generalizations of the Fundamental Theorem of Calculus listed above.

10. Compute gradients and directional derivatives and apply them to finding tangent spaces and normal lines.

Credit Details

Lecture: 4

Lab: 0

OJT: 0

MnTC Goal Area(s): Goal Area 04- Mathematics/Logical Reasoning

Minnesota Transfer Curriculum Goal Area(s) and Competencies

Goal Area 04: Mathematics/Logical Reasoning is already met by the pre-requisite course MATH 1121

Transfer Pathway Competencies

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