Proposed IAI Code MTH 903 M1 900-3

MATH 209

City Colleges of Chicago
Course Title: Calculus and Analytic Geometry III
(IAI Code: MTH 903 M1 900-3)

Length of course:
16 Weeks
Contact Hours:
5 Contact Hours
Credit Hours:
5 Credit Hours
Lecture Hours:
5 Lecture Hours
Lab Hours:
Weekly Plan:
5 Hours
Catalogue Description:
This is the third course in calculus and analytic geometry. It covers vectors and vector operations, Euclidean space, partial derivatives, the Chain Rule; and multiple, line, and surface integrals. The following theorems will be addressed: Green's , Gauss, and Stokes'. Technology and writing as appropriate to the discipline will be emphasized throughout the course.
Students the Course is Expected to Serve:
This course is intended for students who require multivariate calculus and vector analysis.
Pre-requisites:
Placement Test -- or
Prerequisite -- MATH 208 With a minimum grade of 'C' or
Consent of Chair --
Course Objectives:

1. Understand the properties of vectors and apply vector operations in 2- and 3-dimensional space.
2. Conceptualize graphs of surfaces and curves in 3-dimensional space.
3. Understand the concept of differentiability of a function of several variables, including partial derivatives, the total differential and the Chain Rule.
4. Understand the concept of multiple integrals and their applications.
5. Understand the basic theorems of vector analysis such as the Fundamental Theorem of Line Integrals, Green’s, Gauss, and Stokes’ Theorem.

Student Learning Outcomes:
Upon satisfactory completion of the course, students will be able to:

A. Perform vector operations, including dot product, cross product, and the projection of one vector onto another.
B. Determine the parametric and symmetric equations of a line.
C. Determine the equation of a plane.
D. Analyze the graphs of quadric surfaces.
E. Calculate derivatives of vector-valued functions.
F. Calculate unit tangent, unit normal, curvature, and arc length of a space curve.
G. Apply vector operations to motion problems in space.
H. Determine limits, domains and points of discontinuities of real-valued functions of two variables.
I. Calculate first and second partial derivatives.
J. Apply the Chain Rule to multivariate functions.
K. Determine directional derivatives and gradient vectors.
L. Determine the tangent plane to a surface at a point.
M. Determine local extrema and saddle points for functions of two variables.
N. Calculate double and triple integrals, including the use of Fubini’s Theorem.
O. Apply the Jacobian determinant to compute multiple integrals for polar, cylindrical, and spherical substitutions.
P. Compute the divergence and curl of a vector field.
Q. Calculate the line integral and apply the Fundamental Theorem of Line Integrals to a gradient field.

R. Apply Green's Theorem to the calculation of a line integral.
S. Evaluate a surface integral of a vector field.
T. Apply Gauss Theorem to the calculation of a line integral.
U. Apply Stokes' Theorem to the calculation of a surface integral.

Topical Outline:

Week
Topics

1 - 2
- Vectors in Space
- Dot & Cross Products and Projection

3
- Lines & Planes in Space

4 - 6
- Vector-valued Functions
- Tangents, Normals to Curve, Arc Length, & Curvature, Binormal Vector
- Motion Problems in Space

7 - 9
- Functions of Several Variables
- Partial Derivatives & Chain Rule, Total Differential of Function
- Directional Derivatives, Gradient Vector
- The Tangent Plane, the Normal Line
- Extreme Values, Lagrange Multipliers

10 - 12
- Double Integrals
- Triple Integrals
- Change of Variables in Multiple Integrals

13 - 15
- Vector Fields & Line Integrals
- Fundamental Theorem of Line Integrals
- Green's Theorem
- Surface Integrals
- Stoke's Theorem

16
- Final Exam

Calendar:

Methods of Evaluation:

Total Percentage: 0%

The weight given to exams, quizzes, and other instruments used for evaluation will be determined by the instructor.

Methods of Assessment:

Exams, quizzes, homework and other assessments will be used as appropriate to assess student learning.

Methods of Instruction:

Problem-based activities, collaborative-learning techniques, and lecture will be used as appropriate.

Recommended Text:

1. Finney, R. L., Weir, M. D., & Giordano, F. R. *Thomas' Calculus Early Transcendentals* 11th Edition, Pearson Addison Wesley, 2003 ISBN: 0321267591
2. Stewart, J. *Calculus* 6th Edition, Brooks Cole, 2007 ISBN: 0495011606
3. Larson, R., Hostetler, R., & Edwards, B. *Calculus: Early Transcendental Functions* 4th Edition, Houghton Mifflin Company, 2006 ISBN: 0618606246