CALCULUS & ANALYTIC GEOMETRY III
MA 292

Catalogue Description

This course (with MATH 192 and MATH 193) is part of a 12-credit sequence in calculus for pre-engineering students. Topics include polar coordinates and parametric equations, three-dimensional space, vectors, vector valued functions, partial derivatives, multiple integrals, and topics in vector calculus.

Prerequisite: MATH 193 Calculus and Analytic Geometry II or equivalent. (4 credits)

Goals

A. To provide further insight into selected topics of Differential and Integral Calculus.
B. To demonstrate applications of Calculus to Engineering and the Physical Science students.

Procedures

A. Lecture/Discussion
B. Readings and problems assigned.

Course Content

A. Vectors in Space
1. Dot Products and Cross Products
2. Lines and Planes in Space
3. Surfaces in Space
4. Cylindrical and Spherical Coordinates

B. Vector-valued Functions
1. Vector-valued Functions and Curves in Space
2. Projectile Motion
3. Unit Tangent Vector
4. Curvature, Torsion, and the TNB Frame

C. Functions of Two or More Variables and Their Derivatives
1. Functions, Limits, and Continuity
2. Partial Derivatives
3. The Chain Rule
4. Directional Derivatives and Gradient Vectors
5. Tangent Planes and Normal Lines
6. Linearization and Differentials
7. Maxima, Minima, and Saddle Points
8. Lagrange Multipliers

D. Multiple Integrals
1. The Double Integral
2. Volume, Area and Mass
3. Double Integrals in Polar Coordinates
4. Centers of Mass and Moments of Inertia
5. Triple Integrals, Volume and Mass
6. Triple Integrals in Cylindrical and Spherical Coordinates

E. Vector Analysis (Optional)
1. Line Integrals
2. Vector Fields
3. Green's Theorem
4. Surface Integrals
5. Divergence Theorem
6. Stokes's Theorem
7. Independence

Evaluation Methods
1. Preparation of homework assignments.
2. Class Participation
3. Periodic Tests and Comprehensive Final Examination.

Bibliography

Required Text: Finney, Ross L. and Thomas, George B. Jr., Calculus, 2nd Ed., Addison-Wesley Publ. Co., Reading, Mass., 1994.

Required Calculator: TI-81 or TI-82 Graphing Calculator

Larson & Hostetler, Calculus with Analytic Geometry, 5th Ed., D.C. Heath Co., 1994.

Thomas, George B. Jr. and Finney, Ross L., Calculus and Analytic Geometry, 8th Ed., Addison-Wesley Publ. Co., Reading, Mass., 1992.

Relevant Software

Anderson, Richard, Student Edition of MATHCAD, Addison-Wesley Publ. Co., Reading, Mass., 1988.

Finney, Hoffman, Schwartz, Wilde, The Calculus Toolkit, Addison-Wesley Publ. Co., Reading, Mass., 1986.

Pence, Dennis, Calculus Activities for the TI-81 Graphic Calculator, PWS-Kent, Boston, Mass., 1992.

DERIVE - A Mathematical Assistant, Soft Warehouse, Inc., Honolulu, Hawaii