



September 2011

MATH 241 Calculus IV

1. Catalog Description

MATH 241 Calculus IV (4) (Also listed as HNRS 241)

Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Prerequisite: MATH 143.

2. Required Background or Experience

Math 143.

3. Learning Objectives

The student should be able to:

- a. Do partial differentiation and study applications such as tangent planes, maximum/minimum problems with and without constraints.
- b. Do multiple integration and/or applications such as volumes, surface area and moments.
- c. Work with vector fields, and vector integral theorems.

4. Text and References

Stewart, James, Multivariable Calculus, 6th ed., Thomson Brooks/Cole, 2008.

Note: We use a "Custom Edition" of the Stewart text. It differs from the standard edition only in the inclusion of supplementary homework problems at the end of each chapter. Solutions to the supplementary problems are not included in the standard solutions manuals.

5. Minimum Student Materials

Paper, pencils, and notebook.

6. Minimum University Facilities

Classroom with ample chalkboard space for class use.

7. Content and Method

The sections listed below are considered to be the core of the course. It is estimated that about 30 lectures will be needed to cover them. Quarters vary from 38 to 41 lectures. Possible uses for any remaining lectures include:

1. Covering more sections
2. Covering some sections in more depth
3. Computer labs
4. Group projects/class presentations

<u>Content</u>	<u>No. of Lectures</u>
CHAPTER 13 – Vectors and the Geometry of Space	
13.6 Cylinders and Quadric Surfaces (focus on graphing techniques; deemphasize terminology)	1
CHAPTER 15 - Partial Derivatives	11
15.1 Functions of Several Variables	
15.2 Limits and Continuity (may be covered lightly)	
15.3 Partial Derivatives	
15.4 Tangent Planes and Differentials (differentials may be deemphasized)	
15.5 The Chain Rule	
15.6 Directional Derivatives and the Gradient Vector	
15.7 Maximum and Minimum Values	
15.8 Lagrange Multipliers (may be covered lightly or skipped entirely)	
CHAPTER 16 - Multiple Integrals	11
16.1 Double Integrals over Rectangles	
16.2 Iterated Integrals	
16.3 Double Integrals over General Regions	
16.4 Double Integrals in Polar Coordinates	
16.5 Applications of Double Integrals (cover at least one application; center of mass is recommended)	
16.6 Triple Integrals	
16.7 Triple Integrals in Cylindrical Coordinates	
16.8 Triple Integrals in Spherical Coordinates	
CHAPTER 17 Vector Calculus	7
17.1 Vector Fields	
17.2 Line Integrals	
17.3 The Fundamental Theorem for Line Integrals	
17.4 Green's Theorem	
17.5 Curl and Divergence (the vector forms of Green's Theorem should be covered and connections of curl and div with physics should be made)	
	Total 30

Method

Largely lecture with chalkboard illustration of the discussion along with supervised work and individual conferences.

8. Methods of Assessment

The primary methods of assessment are examinations, quizzes and homework. A comprehensive final examination is required. Students are expected to show their work, and are graded on the correctness of their answers as well as their understanding of the concepts and techniques.