

# NEW MEXICO STATE UNIVERSITY

## Department of Mathematical Sciences

### Mathematics 291 - Calculus and Analytic Geometry III

**3 credits**

#### Information For Instructors

**Catalog Description:** Vector algebra, directional derivatives, approximation, max-min problems, multiple integrals, applications, cylindrical and spherical coordinates, change of variables.

**Prerequisite:** Grade C or better in Math 192G.

**Text:** *Calculus: Early Transcendentals, Second Edition*, Jon Rogawski, Freeman, 2012.

**Objectives:** To introduce basic concepts and tools of Analytic Geometry and Multivariable Calculus with strong emphasis on conceptual understanding and applications.

**Content:** The course covers Chapters 12 through 15 of the text. It starts with vectors and analytic geometry in space and then moves to calculus of vector functions, which is presented as a natural extension of one-variable calculus.

The core parts of the course are devoted to techniques and

applications of partial derivatives and multiple integrals with special attention paid to their geometric and physical meaning and significance.

An optional topic is an introduction to vector calculus, mainly to vector fields and line integrals. Its main goal is to prepare grounds for higher-level courses on Differential Equations and Vector Calculus and to help students to feel more at ease in Engineering and Physics courses that use these notions quite early.

**Comments:**

- It is up to the course coordinator and other instructors to decide on the number and timing of exams.
- The use of computers (e.g. Scientific Workplace, Maple, etc.) and/or calculators is at the discretion of the instructor.
- It is recommended that instructors obtain access to the online book so that they can project the 3-d images during lecture. The alternative is to use Scientific Workplace or Maple to create your own illustrations.
- There are several nice places for projects throughout the course; for example, components of acceleration (after Chapter 13) and Lagrange multipliers (Section 14.8).

The following is a sample syllabus for a 15-week semester.

<b>Week</b>	<b>Sections</b>	<b>Topics</b>
1	12.1-12.3	Vectors in the plane and in three dimensions. The dot product.
2	12.4, 12.5	Cross product. Planes in three-space.
3	12.6, 12.7	A survey of quadratic surfaces. Cylindrical and spherical coordinates.
4	13.1, 13.2	Calculus of vector-valued functions.
5	13.3-13.5	Applications: arc length, speed, curvature, motion in three-space.
6	14.1	Functions of several variables.
7	14.2, 14.3	Limits and continuity ( <i>very briefly</i> ). Partial

		derivatives.
8	14.4, 14.5	Differentiability, linear approximation, tangent planes. Gradient and directional derivatives.
9	14.6, 14.7	The Chain rule. Optimization in several variables.
10	15.1	Integration in several variables.
11	15.2	Double integrals over more general regions.
12	15.3	Triple integrals
13	15.4	Integration in polar, cylindrical, and spherical coordinates
14	15.5	Applications of multiple intergals

Revised April 2014.

Approved by the Undergraduate Curriculum and Teaching Committee.