

# MATH 252 (CALCULUS III) SYLLABUS

Revised: January 2011

**Text:** Each instructor chooses his/her own text.

**Prerequisite:** Mathematics 151 with a minimum grade of C.

## Topics:

1. The 3-dimensional space, vectors in two and three dimensions, surfaces, cylindrical and spherical coordinates, the dot product and the cross product, lines and planes.
2. Parametrized curves, tangent vectors, velocity and acceleration, arc length and curvature.
3. Partial derivatives, linear approximations and the differential, the chain rule, the directional derivative and the gradient, maxima and minima, Lagrange multipliers.
4. Double and triple integrals, change of variables, and the area of a parametrized surface.
5. Line integrals, Green's Theorem, curl and divergence.

Optional topics such as Stokes' Theorem and Divergence Theorem can be covered by the instructor if time permits.

## Learning Goals

Math 252 is the third semester of the series, Calculus I-II-III (Math 150-151-252). A majority of the students who major in a branch of engineering or science take Math 252.

The primary learning goals of the course are as follows:

1. Students will acquire the background in the algebraic and geometric properties of **vectors** that is helpful in the formulation and understanding of calculus problems involving functions of several independent and dependent variables.
2. Students will learn about the geometric properties of **parametrized curves** in two or three dimensions, such as **tangent vectors** and **curvature**, and the related concepts of **velocity** and **acceleration** in the dynamical context.
3. Students will learn about **partial derivatives**, **differentiability**, the **gradient** and **directional derivatives**.
4. Students will apply their knowledge of the differential calculus of scalar functions of several variables to the determination of the **maxima** and **minima**.

5. Students will learn about **double** and **triple integrals** in Cartesian, polar and spherical coordinate systems.
6. Students will learn about the concept of a **line integral** and its interpretations as **work** of **flux**.
7. Students will learn about **conservative vector fields**, and some physical applications.
8. Students will learn about **Green's Theorem** and its applications in various physical contexts.