MATH-416 Vector Analysis

Prof. Kevin TeBeest Summer 2013

Course Learning Objectives:

1. Understand the concept of a scalar and a vector field;
2. Use the gradient, and the divergence and curl to analyze scalar and vector fields, respectively;
3. Set up and evaluate line integrals, surface & volume integrals, and use them to describe physical systems;
4. Understand and apply the Divergence theorem, Green's theorem, and Stokes' theorem;
5. Use relevant software (for example Maple) to analyze scalar and vector fields.

APPROXIMATE LECTURE SCHEDULE †

WEEK	SECTIONS	
1	1.1	─ Basic Principles
	1.2	─ Basic Principles
	1.3	─ Scalar Multiplication
	1.4	─ 2D Vectors in Cartesian Coordinates
	1.5	─ 3D Vectors in Cartesian Coordinates
	1.6	─ Types of Vectors
2	1.7	─ Geometry
	1.8	─ Lines
	1.9	─ Scalar Product
	1.10	─ Planes
	1.11	─ Orientation
3	1.12	─ Vector Product
	1.13	─ Triple Scalar Product
	1.14	─ Vector Identities
	1.15	─ Tensor Notation
4	2.1	─ Differentiation
	2.2	─ Space Curves, Tangents, and Arc Length
	2.3	─ Acceleration and Curvature
	EXAM 1 (tentative)	
5	2.4	─ Planar Motion in Polar Coordinates
	3.1	─ Gradients and Isotimic Surfaces
	3.2	─ Vector Fields and Flow Lines
6	3.3	─ Divergence
	3.4	─ Curl
	3.5	─ General Problems Involving Del
	3.6	─ Laplacian
7	3.8,9	─ Vector Identities and Tensors
		─ Vector Identities and Tensors
8	3.10	─ Cylindrical and Spherical Coordinates
	4.1	─ Line Integrals
	4.2	─ Domains and Terminology
	EXAM 2 (tentative)	
9	4.3	─ The Potential Function
	4.4	─ Irrotational Fields
	4.6	─ Oriented Surfaces
10	4.7	─ Surface Integrals
	4.8	─ Volume Integrals
	4.9	─ Divergence Theorem and Stokes' Theorem
11	5.4	─ Green's Theorem
	FINAL EXAM ─ date & time scheduled by Administration	

† This schedule is approximate as some sections will take longer to cover than others. Some sections may be omitted at the instructor's discretion. You should refer to the "Course Web Site" daily for actual assignments.