Math 354: VEC O CALC\L\S II. (4-0-4) 11/21/11

Catalog Description: Review of vector functions, space curves, gradients, and directional derivatives. Introduction to vector analysis: vector elds, divergence, curl, line integrals, surface integrals, conservative elds, and the theorems of Gauss, Green and Stokes with applications to force, work, mass, and charge.

Course Objectives: After completing this course, students will be able to

1. Perform multi-dimensional integration.
2. Use multi-dimensional integration to solve applied problems.
3. Perform computations with multi-dimensional vector functions.
4. Communicate mathematical ideas using correct and appropriate notation.

Learning Outcomes and Performance Criteria

1. Set up and compute multiple and iterated integrals.
   Core Criteria:
   (a) Compute double and triple integrals over a rectangular domain.
   (b) Set-up a double integral over a non-rectangular region.
   (c) Set-up a double integral using polar coordinates.
   (d) Set-up a triple integral in cylindrical coordinates.
   (e)

Additional Criteria:

(a) Use integration to nd the centroid of an object.

3. Understand vector functions in two and three-space, and be able to perform associated computations.

   Core Criteria:

   (a) Compute the gradient of a scalar eld.
   (b) Compute the Jacobian of a transformation.
   (c) Determine if a vector eld is conservative.
   (d) Find the potential of a conservative eld.
   (e) Parameterize a surface or curve.
   (f) Compute the curl and divergence of a eld.
   (g) Parameterize surfaces using rectangular, cylindrical, spherical, other coordinate systems.

   Additional Criteria:

   (a) Use vector calculus to solve applied problems.
   (b) Compute the curvature of a space-curve.

4. All students are required to give a short presentation on one or more of the fundamental integral theorems.

   Additional Criteria:

   (a) Students may be asked to submit a written technical report that supports their presentation.