MA1116 - VECTOR CALCULUS (3-0)

Prerequisite: MA1115
Text: Calculus (Early Transcendentals), 6E Edition, by James Stewart, 2008, Thomson Brooks/Cole, ISBN 0-495-01166-6.

HOURS	TOPICS	SECTION	HOMEWORK
3-3	Vector Fields	16.1	3, 5, 6, 9, 11-14, 15-18, 23, 26, 29-32, 35
3-6	Line Integrals	16.2	1, 3, 5, 11, 17-19, 33, 41-43, 48
3-9	Fundamental Theorem for Line Integrals	16.3	1, 3, 5, 7, 13, 15, 19, 21, 23, 27, 30, 34a
3-12	Green's Theorem	16.4	2, 5, 9, 12, 13, 19, 21
3-15	Curl and Divergence	16.5	3, 5, 6, 9-11, 15, 17, 25, 31, 37, 38
3-18	Parametric Surfaces and Their Areas	16.6	3-6, 13-19, 23, 31, 33, 37, 41, 43
3-21	Surface Integrals	16.7	5, 13, 17, 21, 25, 27, 38, 42, 43, 45
3-24	Stokes' Theorem	16.8	1, 4, 5, 9, 10, 13, 15, 17
3-27	Divergence Theorem	16.9	1, 4, 5, 7, 13, 17, 19, 23, 31, 32
1-28	Summary	16.10	Concept Check, True-False Quiz
5-33	Reviews, Exams, Holidays		

Course Objectives

Upon completion of this course, the student should be able to:

- Sketch vector fields in two or three dimensions. Use them to represent particle displacement, gravitational force, fluid velocity, electric and magnetic fields, or the gradient of a scalar field.
- Evaluate the line integral of a scalar or vector field along a space curve. Calculate the mass and center of mass of a wire, or work done by a force field on a particle moving along a space curve.
- Determine whether or not a vector field is conservative. If it is, find the scalar potential function.
- Use the fundamental theorem for line integrals to evaluate the work done by a conservative vector field. Understand the law of conservation of energy and its application to orbital mechanics.
- Integrate both sides of the scalar form of Green's Theorem. Understand the vector forms of Green's theorem. Use line integrals to calculate area.
- Calculate the curl and divergence of a vector field, and the Laplacian of a scalar field. Give a physical interpretation of the curl and divergence of a velocity field.
- Sketch quadric surfaces and give their equations in implicit, explicit, or parametric form. Find the equations of the tangent planes or unit normal vectors to a surface.
- Use spherical or cylindrical coordinate systems for surfaces with appropriate symmetry.
- Find surface areas and evaluate surface integrals for surfaces given in parametric or explicit form. Calculate the mass and center of mass of a thin shell.
- Evaluate flux integrals. Calculate fluid, electric, or heat flux across a surface.
- Integrate both sides of Stokes' theorem and both sides of the divergence theorem.
- Describe the similarities between the fundamental theorem of calculus, the fundamental theorem for line integrals, Green's theorem, Stokes' theorem, and the divergence theorem.