COURSE SYLLABUS

Course: Calculus of Several Variables
Number: Math 351
Credit-Hours: 4 credits [semester credit hours]

Course Description: Introduces functions of several variables including partial differentiation; multiple integrals, line and surface integrals, and the theorems of Green, Gauss, and Stokes.

Prerequisites: Successful completion (C- or higher) of MATH 214 (Calculus II) or equivalent.

Course Workload: 4 semester credit hours • 3 student work hours per credit hour • 14 week Carnegie semester = 168 hours student course workload average

Examination Requirements: Proctored written final examination must be passed at 60% or higher to earn passing grade in course. "B" and "A" grade paths have additional examinations. See http://www.distancecalculus.com/grades/ for more information.

Course Professor: Robert R. Curtis, Ph.D. <robert@distancecalculus.com> or <rcurtis@rwu.edu>

University Information: Roger Williams University, University College, 1 Empire Plaza, Providence, RI, USA 02903. Accredited by New England Commission of Higher Education (NECHE). See https://www.rwu.edu/academics/accreditations for more information.

E-Textbook: "Calculus&LiveMath" by Davis/Porta/Uhl et al. / Curtis
Mathematics Software: LiveMath™ Computer Algebra & Graphing System

Detailed Syllabus

1. Getting Started
    1.1. Email and Chat
    1.2. Learning About the Course
    1.3. Required Hardware
    1.4. Software Fundamentals

2. Vectors
    2.1. Geometry of Vectors
    2.2. Tangent Vectors; Velocity Vectors, Acceleration Vectors
    2.3. Vector Length
    2.4. Dot Products
    2.5. Vector Projection
    2.6. Perpendicularity
    2.7. Lines
    2.8. Normal Vectors
    2.9. Cross Product
    2.10. Planes in 3D
    2.11. Normal, Binormals, Curvature, Torque

3. The Derivative
    3.1. Partial Derivatives
    3.2. Gradient
    3.3. Level Curves and Surfaces
    3.4. Linearization
    3.5. Total Differential
    3.6. Data Fitting
    3.7. Lagrange Multipliers

4. Vector Fields
    4.1. Plotting and Trajectories
    4.2. Flow-Along and Flow-Across Curves
    4.3. Differential Equations and Vector Fields
    4.4. Path Integrals
    4.5. Gradient Fields
    4.6. Sources, Sinks
    4.7. Divergence Theorem
    4.8. Singularities
    4.9. Rotation and Curl

5. Multiple Integrals
    5.1.   Basic Computation
    5.2.   u-v Transformations; Jacobians
    5.3.   Measurement of Volume, Mass, Density
    5.4.   3D Integrals
    5.5.   Average Value
    5.6.   Fubini's Theorem

6. Other Coordinate Systems
    6.1.   Cylindrical Coordinates
    6.2.   Spherical Coordinates
    6.3.   Integration in Other Coordinate Systems

7. Gauss, Green, Stokes Theorems
    7.1.   Green's Theorem
    7.2.   Stokes' Theorem
    7.3.   Divergence Theorem
    7.4.   Generalized Fundamental Theorem of Calculus
    7.5.   Sources, Sinks, and 3D Gauss's Formula
    7.6.   Surface Integrals