

Math 4910-C Syllabus—Fall 2008

Course Title: Conceptual Calculus III (Multivariable Calculus)

Credits: 3 semester

Prerequisites: Calculus II

Textbook: Calculus Concepts and Contexts (2nd ed.) by James Stewart

Meeting Schedule: Tuesdays (Aug. 28 – Dec. 11), 4:30 p.m. to 7:15 p.m. at your distance delivery site (class originates from USU's Logan Campus, Engr 401)

Instructor: Eric Rowley
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Office Hours: MWF 10:30-12:15 a.m. or by appointment

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Student Teaching Assistants: Andy Merrill e-mail: acmerrill@cc.usu.edu

Students (more like colleagues, really):

This course is mostly populated by, but not restricted to, public school teachers seeking to upgrade their math-teaching endorsement levels by participation in the UMEP program. Further information about UMEP can be found at www.umepp.usu.edu.

Course Goals:

The principal course goal is for you to have a meaningful learning experience as you interact with the course content. Pragmatically speaking the goal is for you to accomplish a Multivariable Calculus course requirement needed for the math level endorsement you may be seeking.

Course Content:

The content of Conceptual Calculus III (Multivariable Calculus) is organized into overlapping sections outlined at the end of this document (we will “cover” section I, section II will be addressed to the degree time allows. You will interact with this content by constructing concepts, discovering relationships, comprehending vocabulary and notation, developing algorithmic skills, memorizing basic facts, applying knowledge and skills to real, contrived, and mathematical situations, etc.



Classroom Procedures:

Attendance and participation are welcomed, encouraged, crucial, and mandatory. Certain procedures explained during our first meeting will govern this participation based on the constraints caused by the distance delivery nature of the course.

Much of the out of class communication and course management/administrative handling will be done on BlackBoard (BB). If you are new to BB or have difficulties contact Andy at acmerrill@cc.usu.edu for help.

Homework, Quizzes, Tests, Grades, etc.:

All homework should be kept in a journal along with your notes, etc. Your journal will be submitted after the course has ended but before a letter grade is given. Your journal should be organized into sections. It should include individual sections for each of the following:

- Notes
- Homework
- Basic/familiar real-valued functions of a single variable and Cartesian equations in two variables, and their graphs (curves in 2-space)
- Trigonometry reference page
- Basic derivative definitions, techniques of differentiation, and derivative formulas for functions of a single variable
- Basic techniques integral definitions, techniques of integration, and integration formulas for functions of a single variable
- Basic/familiar real-valued functions of two variables and Cartesian equations in three variables and their graphs (surfaces in 3-space)
- Major/fundamental definitions
- Major theorems
- Applications of partial derivatives
- Applications of integrals
- Basic/familiar vector-valued functions and their graphs (parametric curves)
- Summary of the interrelated theorems about conservative vector-fields found in sections 13.3 and 13.5
- General summary of line- and surface-integrals
- Essay including self-evaluation regarding course goals
- Other (at Eric's or your discretion)

Homework will be assigned at each class meeting. Based on your stature as professionals, it is presumed the assignments will be completed thoroughly, accurately, neatly/organized, and on time. Nonetheless, to help motivate you to keep from falling behind, homework will be collected and graded based on completion and accuracy. To submit your assignments, you may scan it into a pdf document (or otherwise create a computer file) and upload it to BB or fax it to Andy Merrill (UMEP TA). The fax number is 435-797-1822.

There will be a midterm test and a final test (not comprehensive) to gauge and/or motivate progress.

Your homework scores, journal, and two test scores, will (in equal parts) be the basis for your final grade.

Americans with Disabilities Act:

Title II of the Americans with Disabilities Act mandates that all state and local government programs be administered in such manner as to protect qualified individuals with disabilities from discriminatory treatment. Utah State University complies with this policy, and therefore:

If you need accommodations because of special exceptionalities, please meet with Eric during the first week of the semester to make arrangements. Accommodations including alternative format print materials (e.g., larger print, audio, diskette, Braille, etc.) are available through the Disability Resource Center, located in Taggart Student Center room 104, phone number (435)797-2444.

Content Outline:

- I. Real-valued functions of two or more variables
 - A. Graphs
 1. Domain and Range
 2. Graph sketching using traces
 3. Level curves and level surfaces
 - B. Limits
 - C. Continuity
 1. Extreme Value Theorem
 - D. Partial derivatives
 1. Definitions, vocabulary, and notation
 2. Computation
 - a. By direct application of definition
 - b. Differentiation techniques
 - c. Implicit differentiation
 3. Applications
 - a. Instantaneous rate of change in various contexts
 - b. Gradient and directional derivatives
 - c. Optimization
 - d. Tangent planes/linear approximations
 - E. Integration
 1. Double integrals
 - a. Definition, vocabulary, and notation
 - b. Computation
 - a. Fubini's Theorem
 - b. Change of variables
 - i. Polar coordinates
 - c. Applications
 - a. Area, volume, and surface area
 - b. Moments and center of mass of a lamina

2. Triple integrals
 - a. Definition, vocabulary, and notation
 - b. Computation
 - a. Generalized Fubini's Theorem
 - b. Change of variables
 - i. Cylindrical coordinates
 - ii. Spherical coordinates
 - c. Applications
 - a. Volume
 - b. Moments and center of mass of a solid
3. Line integrals of real-valued functions
 - a. Definition, vocabulary, and notation
 - b. Computation
 - a. By converting to a single integral
 - c. Applications
 - a. "Curtain area"
 - b. Arc length
 - c. Moments and center of mass of a wire
4. Surface integrals of real-valued functions
 - a. Definition, vocabulary, and notation
 - b. Computation
 - a. By converting to double integral
 - c. Applications
 - a. Surface area
 - b. Moments and center of mass of a surface

II. Vector fields

- A. Sketching/graphing
- B. Conservative vector fields
- C. Curl and Divergence
- D. Integration
 1. Line integrals of vector fields
 - a. Definition, vocabulary, and notation
 - b. Computation
 - a. By Converting to a single integral
 - b. Fundamental Theorem of line integrals
 - c. Greene's Theorem
 - c. Applications
 - a. Work
 2. Surface integrals of vector fields
 - a. Definition, vocabulary, and notation
 - b. Computation
 - a. By Converting to a double integral
 - b. Stoke's Theorem
 - c. Divergence Theorem
 - c. Applications
 - a. Flux