MATHEMATICS 222

Calculus IV

MAT 222 Textbook and other Instructional Materials: Calculus, Early Transcendental Functions , 4th edition, by Larson, Hostetler and Edwards

A number of other software packages downloaded from the internet will be utilized.

Prerequisites: MAT 221

Projects:

Writing Projects:

Useful Periodicals:

- The American Mathematical Monthly, published by the Mathematical Association of America, 1529 Eighteenth Street, NW, Washington, DC 20036-1385
- The College Mathematics Journal, published by the Mathematical Association of America, 1529 Eighteenth Street, NW, Washington, DC 20036-1385
- Mathematics Magazine, published by the Mathematical Association of America, 1529 Eighteenth Street, NW, Washington, DC 20036-1385

Examples of Assigned Articles

- *Examining Continuity, Partial Derivatives and Differentiability with Cylindrical Coordinates*, Thomas McMillan, CMJ, Vol 34, #1, Jan 2003
- *Moire Fringes and the Conic Sections*, Mike Cullen, CMJ, November 1990
- *Partial Differentiable, Yes; Continuous, No*, David Calvis, CMJ, Vol 31, #1, Jan 2000
- *Mixed Partial Derivatives and Fubini's Theorem*, Aksoy and Martelli, CMJ, Vol 33, #2, March 2002

Each of these papers should be read and a written review prepared. In the review, the student should point out the major points of the article including how the article related to the material being studied in Calculus IV. Comments on the examples presents and on "obvious" statements given should be included. Any extensions, applications or connections to other material that the student discovers should be included.

Group Project: In groups of two or three students, take some play-doh and determine it's volume using some standard shape. Then, reshape the play-doh into some "interesting" non-canonical shape. Using dental floss, divide the mass into uniformly

thick slices. Then, divide each slice into uniformly thick strips. Then, divide each strip into uniformly thick boxes. Measure the volume of a few if the boxes and use an average as the standard volume dV for approximating the volume of the original shape. Compare to the exact volume. Prepare of paper reviewing with your findings and relate to techinques for integration with respect to dz dy dx. Post the results on the facebook group for this class.

Computational Project: Using software (such as Winplot), create the graph of an interesting surface with tangent lines in x- and y-directions at various points using animated parameters. Create the gradient vector at each point as well.   Use the above information to animate the tangent planes to the surface.   Email your resulting file to the professor and come by the office to show that is works correctly.

Course Description: Description from the college catalog: A study of vectors in three dimensions, partial differentiation, the gradient and applications, double and triple integrals, vector fields and line and surface integrals.

This course carries 3 hours of academic credit.

The student who is prepared for a study of Calculus IV is assumed to be proficient with the following:

- Limits by the rules
- Continuity
- Definition of Derivative
- Derivatives by the Rules
- Application of the Derivative
- Mean Value Theorem for Derivatives
- Definition of Integral
- Integration Rules
- Logarithms and Exponentials
- Inverse Trig Functions
- Integration by Parts
- Partial Fractions
- Polar, cylindrical and spherical coordinates
- Plane curves and parametric equations
- Vectors in the plane and vectors in space
- Vector-Valued Functions
- Velocity and Acceleration vectors in space
- Curvature

Learning Objectives: The student will demonstrate a comprehensive understanding of the following:

- Multivariate functions

- Partial Derivatives and differentials
- Chain Rule for multi-variate functions
- Directional Derivatives and Gradients
- Tangent Planes and Normal Lines
- Exterma for multi-variate functions
- Lagrange Multipliers and Constrained Optimization
- Vector Fields
- Double and Triple Integrals and various applications (Winplot sliced volume)
- Line Integrals
- Fundamental Theorem of Line Integrals
- Exact Differential Equations
- First Order Linear Differential Equations
- Higher order constant coefficient linear differential equations

(Roughly chapters Thirteen thru Sixteen of the text.)
In aiming at these target ideas, we will use graphical calculators and computers to promote better intuition, greater understanding and increased proficiency in doing mathematics.

Meetings: This class meets as scheduled. You are expected to be in class on time. University policy states that a student cannot miss more than 25% of class meetings and receive credit for the course. Further, attendance will be necessary in order to understand the material and make a good grade. The student is responsible for work and material missed when absent. Cheating in any way will be properly rewarded according to University policy (Tomahawk; Undergraduate Bulletin; http://www.mc.edu/publications/policies/219.html).

Grading: Assessment of the student's progress will be made through regular homework exercises and periodic examinations as well as through classroom feedback.   During the term, there will be at least three exams during the semester. Homework will be assigned and graded online. Additional daily work may be assigned during the term and an average of these daily grades will count for 10% of your final grade. The remaining 90% of your final grade will be based on an average of the periodic exams.

Any daily work missed will be awarded a grade of zero. Near the end of the term, an out-of-class, comprehensive makeup exam will be given for any student missing one or more excused exams.

The grading scale is

A=90-100
B=80-89
C=70-79
D=65-69
F=0-64

Aim now for the desired grade. Finally, all graded work will be returned to the student for keeping. If there were any question later about your grade, you would be expected to show these papers.

MISSISSIPPI COLLEGE ACADEMIC POLICIES:
Students should consult the Mississippi College policy manual located at http://www.mc.edu/resources/publications/policies/ for official information regarding:
- Class attendance - Policy 2.10
- Grading - Policy 2.15
- Cheating - Policy 2.19
- Counseling and Career Services - Policy 2.25
- Research - Policy 2.27
- Counseling and Testing Center - Policy 2.34

Students who may require accomodation due to a documented handicap should follow the procedures located at http://www.mc.edu/about/offices/counseling/disabilities/

The Generic Grading Scale for this course is A = 90-100, B = 80-89, C = 70-79, D = 60-69. Individual instructors are free to choose a different grading scheme so students should consult their section's particular syllabus for the official grading scale to be utilized.

Tutoring Hours:
Hours and location for the departmental tutoring center are posted at http://www.mc.edu/academics/academic-tutoring/ .