Math 302
Calculus III

Text: *Multivariable Calculus*, 5th edition, McKallum, Hughes-Hallett, and Gleason, Wiley, 2009

Prerequisites: Math 301 with a grade of C or better, or transfer credit in an equivalent course from another university.

Calculus is a branch of mathematics which for over three centuries has served as the basis for the analysis of continuous change. Applying calculus to real-life problems in science, engineering, or other fields requires both an understanding of how the mathematics can be used to model problems and the capability of performing the calculations and computations necessary to obtain solutions. Most calculus courses emphasize the computational aspects of the subject, presenting calculus as a collection of formulas and algorithms to be learned and then applied to problems which have been carefully contrived to work out nicely. However, recent years have seen the development of powerful graphing calculators and computer software packages which can perform all of the numerical and symbolic calculations needed in calculus and can also produce a variety of graphics which help in visualizing complex relations. The availability of these calculators and computer systems has led to a national movement to change the focus of calculus courses from computational techniques to the study of fundamental concepts and significant applications.

Our new textbook concentrates on the most important topics of calculus (limits, derivatives, integrals, etc.), but with emphasis on the graphical and numerical representation of functions and other relations as well as the traditional use of symbolic formulas. Students frequently complain that they have difficulty reading a traditional calculus book, and that they therefore count on the instructor to explain the material through lectures. Their use of the book is thus limited to looking at examples of solved problems and then working on similar homework exercises. In contrast, the materials in our new text are meant to be read thoroughly and carefully. The writing is plain and straight-forward. While the text does contain some routine "drill" exercises, the authors have included several other types of in-depth problems designed to develop conceptual understanding. A number of the problems are intended to be discussed by students working together in small groups. This new approach to calculus is enhanced by the availability of new technology, which can heighten our understanding of mathematical relationships. In this course, the graphing calculator will be the standard tool for visualization and numerical computation.

This syllabus is an outline for 50 class periods of Calculus III. The additional class periods will be devoted to review and assessment.

Lesson	Section and Topic	Assignment
1	12.1 Functions of Two Variables	2, 3, 6, 8, 11, 14, 16, 19, 22, 24, 26, 28, 30, 34
2	12.2 Graphs of Functions of Two Variables	1, 2, 4, 6, 7, 8, 10, 11, 14, 15, 17, 25, 27, 28
3	12.3 Contour Diagrams	1, 2, 4, 6, 8, 10, 11, 13, 14, 16, 21, 22, 24, 26, 32
4	12.4 Linear Functions	2, 4, 6, 7, 8, 12, 13, 16, 17, 22, 24, 26
5	12.5 Functions of Three Variables	2, 4, 5, 9, 11, 14, 16, 18, 23, 25, 28, 30, 31, 33
6	12.6 Limits and Continuity	2, 5, 7, 11, 13, 14, 16, 18
7	13.1 Displacement Vectors	6, 10, 16, 22, 25, 26, 30, 33, 36, 38, 41
8	13.2 Vectors in General	6, 8, 10, 11, 14, 17, 21, 24, 26, 30, 35
9	13.3 The Dot Product	4, 6, 8, 9, 11, 14, 15, 16, 19, 22, 25
10	13.3 The Dot Product (cont.)	28, 29, 31, 33, 35, 38, 41, 44, 46, 47, 55
11	13.4 The Cross Product	2, 6, 11, 13, 16, 18, 24, 26, 28, 31, 34, 36
12	14.1 The Partial Derivative	2, 3, 4, 7, 10, 14, 17, 19, 22, 23, 30
13	14.2 Computing Partial Derivatives Algebraically	1, 2, 5, 8, 9, 16, 20, 23, 26, 28, 33, 38, 40, 43, 44
14	14.3 Local Linearity and The Differential	2, 5, 8, 10, 13, 16, 18, 21, 24, 27, 31
15	14.4 Gradients and Directional Derivatives in the Plane	2, 5, 9, 12, 15, 18, 21, 22, 24, 27, 28, 31, 34, 38, 42
16	14.4 Gradients and Directional Derivatives in the Plane (cont.)	44, 46, 48, 53, 56, 58, 60, 61, 63, 65, 68, 70, 75, 79
17	14.5 Gradients and Directional Derivatives in Space	2, 5, 8, 17, 20, 23, 26, 29, 33, 38, 42, 45, 48, 51, 58
18	14.6 The Chain Rule	2, 5, 8, 11, 14, 17, 18, 21, 23, 24
19	14.7 Second-Order Partial Derivatives	1, 4, 7, 10, 20, 22, 25, 28, 36, 40, 41, 43
20	14.7 Second-Order Partial Derivatives (cont.)	12, 15, 17, 32, 47
21	15.1 Local Extrema	2, 3, 6, 8, 11, 14, 18, 24, 28

Lesson	Section and Topic	Assignment
22	15.2 Optimization	2, 5, 7, 10, 13, 16
23	15.2 Optimization (cont.)	18, 21, 22, 24, 27
24	15.3 Constrained Optimization: LaGrange Multipliers	2, 5, 7, 10, 14, 17, 18
25	15.3 Constrained Optimization: LaGrange Multipliers(cont.)	19, 20, 22, 29, 32
26	16.1 The Definite Integral of a Function of Two Variables	1, 4, 5, 10, 13, 15, 18, 20, 23, 27
27	16.2 Iterated Integrals	2, 3, 5, 8, 10, 13, 15, 17, 19, 21, 23, 27
28	16.2 Iterated Integrals (cont.)	29, 31, 32, 35, 38, 40, 43, 47
	16.3 Triple Integrals	1, 4, 6, 8, 11, 13, 15, 18
29	16.3 Triple Integrals (cont.)	20, 23, 27, 30, 32, 37, 40, 43, 46, 56, 60
	16.4 Double Integrals in Polar Coordinates	4, 6, 8
30	16.4 Double Integrals in Polar Coordinates (cont.)	10, 12, 15, 17, 19, 21, 24, 26, 28, 31, 33
31	16.5 Integrals in Cylindrical and Spherical Coordinates	2, 5, 9, 12, 14, 23, 26, 27, 29, 33, 40, 44, 52
32	16.5 Integrals in Cylindrical and Spherical Coordinates (cont.)	3, 6, 9, 10, 15, 19, 21, 28, 30, 32, 34, 38, 47, 50
33	16.7 Change of Variables in a Multiple Integral	1, 3, 6, 8, 11, 13, 16, 19, 21, 25
34	17.1 Parameterized Curves	1, 4, 7, 11, 15, 19, 23, 26, 30, 33, 37, 41, 47, 50, 55, 57
35	17.2 Motion, Velocity, and Acceleration	2, 5, 9, 12, 15, 17, 19, 23, 26, 29, 32, 36, 41
36	17.3 Vector Fields	2, 6, 8, 9, 12, 16, 19, 22, 25, 27, 30
37	17.4 The Flow of a Vector Field	3, 6, 8, 15, 17, 18, 21
38	17.5 Parameterized Surfaces	2, 5, 8, 11, 14, 17, 20, 23, 25, 28, 32, 35, 38
39	18.1 The Idea of a Line Integral	2, 5, 9, 12, 15, 18, 19, 21, 23, 25, 32, 34, 36, 40, 45
40	18.2 Computing Line Integrals Over Parameterized Curves	2, 4, 7, 11, 14, 17, 19, 22, 24, 26, 31, 32, 33
41	18.3 Gradient Fields and Path-Independent Fields	2, 4, 6, 10, 13, 16, 20, 22, 25, 26, 29, 31, 34, 42
42	18.4 Path-Dependent Vector Fields and Green's Theorem	2, 5, 9, 12, 14, 16, 20, 22, 25, 27, 34
43	19.1 The Idea of a Flux Integral	2, 4, 6, 9, 12, 14, 18, 23, 27, 32, 34, 36, 38, 43, 50
44	19.2 Flux Integrals for Graphs, Cylinders, and Spheres	1, 4, 7, 9, 12, 16, 19, 22, 26, 29
45	19.3 Flux Integrals Over Parameterized Surfaces	1, 3, 6, 7, 9, 11, 12, 17
46	20.1 The Divergence of a Vector Field	2, 5, 8, 11, 12, 14, 17, 20, 25, 29, 33, 36
47	20.2 The Divergence Theorem	1, 4, 7, 11, 15, 18, 22, 28, 31, 36
48	20.3 The Curl of a Vector Field	2, 6, 9, 12, 15, 18, 21, 25, 26, 32
49	20.4 Stokes' Theorem	1, 4, 8, 11, 14, 18, 22, 25, 28, 31
50	20.5 The Three Fundamental Theorems	1, 2, 5, 8, 9, 11, 12

Emergency Evacuation Procedure: A map of this floor is posted near the elevator marking the evacuation route and the **Designated Rescue Area**. This is an area where emergency service personnel will go first to look for individuals who need assistance in exiting the building. Students who may need assistance should identify themselves to the teaching faculty.

Last updated 2 August 2009.