MAT 136 Calculus I
Master Course Syllabus Effective Spring 2002
Department of Mathematics and Statistics
College of Arts and Sciences
Northern Arizona University

GENERAL INFORMATION

MAT 136 is a four credit course meeting 200 minutes each week. It applies toward the Science/ Applied Science distribution block in the University Liberal Studies Program.

CATALOG DESCRIPTION

Introduction to calculus of one variable; basic concepts, interpretations, techniques, and applications of differentiation and integration. *Prerequisite*: Grade of C or better in MAT 125 or satisfactory placement. Offered all semesters.

COURSE DESCRIPTION

MAT 136 presents the concepts, methods and applications of elementary calculus, especially, differentiation, integration, and applications. The material is presented from analytic, graphical, and numerical view points. The intention is to develop understanding of the concepts of calculus, skill with the methods, ability to apply the calculus, ability to interpret results, critical reasoning and analysis skills, and communication skills.

In particular, with regard to liberal studies, MAT 136 will address the essential skills of *critical thinking*, *quantitative analysis* and *use of technology*. The Technology and its Impact Theme pertains to MAT 136 in that the course in itself develops the substantial technology of the calculus and calculus is fundamental to the development of technology and technological applications. The Environmental Consciousness Theme pertains to MAT 136 in that the concepts and interpretations are fundamental to understanding scientific principles of our world and universe.

COURSE STRUCTURE AND APPROACH

This course will use a mix of lecture, discussion, class participation and group activities according to instructor design. In addition, students will regularly use technology in the form of computer packages (e.g., *Mathematica, Mathcad*) or graphing calculators.

TEXTBOOK AND REQUIRED MATERIALS

Calculus--Concepts and Contexts, 2nd ed., Stewart, 2001, Brooks-Cole.

COURSE OBJECTIVES
By the end of the course, students should be able to:

Objective	Assessment
1. Express understanding of and related interpretations of the concepts of limit, derivative and integral in writing and via computations, graphs, numerical values and mathematical symbolism. (Technology and its impact, environmental consciousness, critical thinking, quantitative analysis, use of technology)	Examination questions, technology projects. Some may also use writing assignments, homework, or quizzes.
2. Calculate exactly or approximate as appropriate limits, derivatives and integrals from formulas, tables, and graphs. (Technology and its impact, quantitative analysis, use of technology)	Examination questions, gateway exam, technology projects. Some may also use homework or quizzes.
3. Apply the derivative to analyze graphical behavior, motion problems, other rate problems and optimization problems. (Technology and its impact, environmental consciousness, critical thinking, quantitative analysis, use of technology)	Examination questions and technology projects. Some may also use applied projects, homework, or quizzes.
4. Apply the definite integral to analyze motion problems, change and rate of change problems and area problems. (Technology and its impact, environmental consciousness, critical thinking, quantitative analysis, use of technology)	Examination questions and technology projects. Some may also use applied projects, homework, or quizzes.

ASSESSMENT

The assessment procedures include: a minimum of three in-class exams; a minimum of eight technology projects using computer packages or graphing calculators; some selection of (a) graded homework assignments, (b) quizzes, (c) writing assignments, (d) applied group or individual projects, and (e) gateway exams; and a comprehensive final examination worth at least 20% of the overall grade.

COURSE OUTLINE; POSSIBLE TIMELINE

1. Functions and Models - 6-7 days
   Review of functions including linear, exponential, power, logarithmic, trigonometric, polynomial and rational functions. Inverse functions, compositions and transformations, and modeling.

2. Limits and Derivatives - 12-13 days
   Development of the notion of derivative via tangents and velocity. Limits of a function, limit laws, limits involving infinity, continuity, tangents, velocity and other rates of change, formal derivatives as functions, linear approximations, relationships between properties of a function and its derivative.

3. Differentiation Rules -10-11 days
   Derivatives of Polynomial, Exponential, Trigonometric and Logarithmic Functions; Product and Quotient Rules, the Chain Rule, Implicit Differentiation, Linear Approximations.

4. Applications of Differentiation - 11-12 days
   Related rates, Maxima/Minima, creation and analysis of graphs of functions, Indeterminate forms and L'Hospital's Rule, Applied optimization problems, Antiderivatives with applications to the analysis of motion.

5. The Integral - 13-14 days
   Computation of areas and distances, Definite Integrals, Fundamental Theorem of Calculus, Substitution, Integration by Parts, Use of integral tables, integral approximations, improper integrals, standard applications and interpretations of integrals including area between curves and average value of functions.

LEARNING PORTFOLIO
Writing assignments or project reports would be appropriate choices for the learning portfolio, if either is part of the section requirements.

COMPUTER LAB FEE
The course carries a fee for the use of the Department of Mathematics and Statistics computer lab.

ASSIGNMENTS, EXAMINATIONS, GRADING AND OTHER POLICIES
Other policies will be included on individual course information sheets.