

## I. Course Description

This is a 4 credit hour course. The prerequisite for this course is qualification through placement, or a grade of C or better in Math 115 or Math 112. The material for this course is basic calculus: functions, limits, derivatives, introduction to integrals, the Fundamental Theorem of Calculus, applications of derivatives and integrals. This course also has a lab component in which student will learn to use Maple software. Maple is a tool that allows symbolic computation and simulations. The weekly lab meetings are an integral part of Calculus I. These labs are designed with (at least) two purposes:

- to provide hands-on activities that will further your understanding of calculus.
- to provide an introduction to and instruction in the use of modern computer software (Maple)

## II. Goals and Learning Outcomes

The main goal of this course is to introduce you to the fundamentals of calculus. This course will give you a solid background for more advanced math, science and computing courses.

By the end of this course, you will be able to:

- ❖ construct calculus-based models of real world problems;
- ❖ apply calculus-based techniques to solve real-world problems;
- ❖ apply differential-calculus techniques to optimize curves that model real-world situations;
- ❖ apply integral-calculus techniques to find areas;
- ❖ use limits to predict the behavior of curves;
- ❖ quickly compute common derivatives and integrals;
- ❖ describe the shapes of graphs using limits and derivatives.

Section-by-section course objectives:

Section	Description
1.1	Review of functions
1.2	Review of graphs
1.3	Review of making new functions from old ones
1.4	Review of common families of functions

1.6	Review of exponential and logarithmic functions
1.8	Introduction to parametric equations
2.1	Introduction to limits
2.2	Computing limits (the finite case)
2.3	Computing limits at infinity and the end behavior of a function
2.4	More advanced topics concerning limits
2.5	Introduction to continuity
2.6	Continuity of trigonometric and inverse functions
3.1	Introduction to tangent lines, velocity and rates of change
3.2	Introduction to the derivative function
3.3	Techniques of differentiation
3.4	Introduction to the product and quotient rules
3.5	Introduction to the derivatives of trigonometric functions
3.6	Introduction to the chain rule
3.7	Introduction to related rates
4.1	Introduction to implicit differentiation
4.2	Introduction to the derivatives of logarithmic functions
4.3	Introduction to the derivatives of exponential and inverse trig functions
4.4	Introduction to L'Hopital's rule and indeterminate forms
5.1	Discussion of the direction and concavity of curves
5.2	Introduction to and analysis of relative extrema
5.3	Sophisticated curve sketching
5.4	Introduction to and analysis of absolute extrema
5.5	Real world applications of the material learned in 5.4
5.7	Introduction to and applications of Rolle's Theorem and the Mean Value Theorem
5.8	Introduction to rectilinear motion
6.1	Introduction to area and the indefinite integral
6.2	More about area and the indefinite integral
6.3	Introduction to integration by substitution
6.4	Introduction to the concept of area as a limit; intro to sigma notation
6.5	Introduction to the definite integral
6.6	Introduction to and applications of the Fundamental Theorem of Calculus
6.7	Rectilinear motion using integration
6.8	Integration by substitution
6.9	The logarithm as an integral.