

## **Course Description**

### **MAC2311 | Calculus and Analytical Geometry 1 | 5 credits**

In this course, students will develop problem solving skills, critical thinking, computational proficiency, and contextual fluency through the study of limits, derivatives, and definite and indefinite integrals of functions of one variable, including algebraic, exponential, logarithmic, and trigonometric functions, and applications. Topics will include limits, continuity, differentiation and rates of change, optimization, curve sketching, and introduction to integration and area. Student learning outcomes: students will calculate a limit, derivative, or integral using appropriate techniques; students will determine the continuity and differentiability of a function; students will use limits and derivatives to analyze relationships between the equation of a function and its graph; students will apply differentiation techniques to model and solve real world problems; and students will use integrals and the fundamental theorem of calculus to analyze the relationship between the integral of a function and the related area. Prerequisites: MAC1106 and MAC1114, or MAC1114 and MAC1140, or MAC1147 with a grade of "C" or better or departmental permission. Fulfills Gordon Rule computational requirement

## **Course Competencies**

### **Competency 1:**

The student will demonstrate knowledge of limits by:

- Computing limits at a point and at infinity algebraically.
- Finding limits using L'Hopital's Rule.
- Applying the definition of continuity.
- Determining where a function is continuous or discontinuous.

## **Learning Outcomes**

- Critical thinking
- Information Literacy
- Numbers / Data

### **Competency 2:**

The student will demonstrate knowledge of differentiation by:

- Defining the derivative of a function as a limit.
- Finding the derivative of a function using the definition.
- Finding the equation of the line tangent to a curve at a point using a derivative.
- Finding the rate of change of a function using a derivative.
- Finding derivatives of polynomial, trigonometric, exponential, logarithmic, and hyperbolic functions using differentiation rules.
- Finding derivatives using the chain rule.
- Implicitly differentiating equations.
- Computing higher order derivatives.
- Determining maximum and minimum points of a function and intervals where it increases or decreases.
- Determining points of inflection of a function and intervals where it is concave upward or concave downward.
- Using the first and second derivative tests to find local extrema.
- Applying Rolle's theorem and the mean value theorem.

- Solving optimization problems.
- Solving problems involving related rates.

### **Learning Outcomes**

- Communication
- Critical thinking
- Information Literacy
- Numbers / Data
- Social Responsibility

### **Competency 3:**

The student will demonstrate knowledge of integration by:

- Finding antiderivatives involving polynomial, trigonometric, inverse trigonometric, exponential, logarithmic, and hyperbolic functions.
- Evaluating a definite integral as a limit of a Riemann sum.
- Computing the average value of a function over an interval.
- Computing definite integrals using the fundamental theorem of calculus.
- Solving applied problems using definite integrals.
- Finding indefinite integrals with a change of variables.
- Finding the area or regions under and between curves.
- Finding the volume of solids of revolution.

### **Learning Outcomes**

- Communication
- Critical thinking
- Information Literacy
- Numbers / Data
- Social Responsibility