Mathematics 2413 – Calculus 1

Student Learning Outcomes

1. The students will demonstrate factual knowledge including the mathematical notation and terminology used in this course. Students will read, interpret, and use the vocabulary, symbolism, and basic definitions used in Calculus I as they pertain to functions, limits, derivatives, and integrals.

**2. The students will describe the fundamental principles including the laws and theorems arising from the concepts covered in this course.** Students will identify and apply the laws and formulas that result directly from the definitions; for example, domain and range of a function, operations on functions, the limit laws, the differentiation formulas, and the Fundamental Theorem of Calculus.

**3. The students will apply course material along with techniques and procedures covered in this course to solve problems.**  Students will use the facts, formulas, and techniques learned in this course to sketch graphs of functions, to study position-velocity-acceleration problems, to solve related rate and optimization (“max-min”) problems, and to determine the area under the curve of a function.

**4. The students will develop specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields.** Students will acquire a level of proficiency in the fundamental concepts and applications necessary for further study in academic areas requiring Calculus I as a prerequisite, or for work in occupational fields requiring a background in Calculus I. These fields might include computer science, engineering, the physical and natural sciences as well as mathematics.

# **Course Content**

**Textbook:** *Essential Calculus: Early Transcendentals;* 2nd edition; by James Stewart. The following chapters are covered. (See textbook "Contents")

1. **Functions and Limits**: Functions and Their Representations, A Catalog of Essential Functions, The Limit of a Function, Calculating Limits, Continuity, Limits Involving Infinity.
2. **Derivatives:** Derivatives and Rates of Change, The Derivative as a Function, Basic Differentiation Formulas, The Product and Quotient Rules, The Chain Rule, Implicit Differentiation, Related Rates, Linear Approximations and Differentials.
3. **Inverse Functions:** Derivative of Logarithmic and Exponential Functions, Inverse Trigonometric Functions, Indeterminate Forms and l’Hospital’s Rule.
4. **Applications of Differentiation**: Maximum and Minimum Values, the Mean Value Theorem, Derivatives and Shapes of Graphs, Curve Sketching, Optimization Problems, Antiderivatives.
5. **Integrals.** Areas, the definition of the definite integral, the Fundamental Theorem of Calculus, properties of the definite integral, indefinite integrals, substitution.

**Optional Topics:** Exponential Functions (3.1), Inverse Functions and Logarithms (3.2), Exponential Growth and Decay (3.4), Hyperbolic Functions (3.6)