Department: MATHEMATICAL SCIENCES   Semester Hours: 4

Course Title and Number: MATH 229   CALCULUS I

Course Description: A first course in calculus of functions of one variable. Includes the study of limits, continuity, differentiation and elementary integration. Taught as both a general education course and a first course for majors in mathematics, science, and engineering.

PRQ: College algebra and trigonometry as measured by a satisfactory performance on the Mathematics Placement Examination.

Course Objectives:

- To understand and connect concepts of the calculus with real world problems and other scientific disciplines.

- To value mathematics and develop an ability to communicate mathematics, both in writing and orally.

- To develop mathematical reasoning, and an ability to solve problems.

- To attain computational facility in differential calculus.

  (More detailed objectives appear in the Assessment Appendix.)

Content:

- Preliminary topics: A short review of analytic geometry and trigonometry; inequalities and absolute values; lines and tangent lines.

- Limits and continuity: Geometric understanding of the definition of limit; one-sided limits; properties of limits, continuity at a point; continuity on an interval, properties of continuous functions; the Intermediate Value Theorem.

- Derivatives: The derivative as a limit; derivatives of polynomials, products, powers, and quotients of functions; implicit differentiation; linear approximation and differentials; the chain rule; derivatives of trigonometric functions; Newton's method; formal computation of partial derivatives.

- Applications of derivatives: Curve sketching, concavity, points of inflection, asymptotes and symmetry; maxima and minima (including applications); related rates (including applications); the Mean Value Theorem.

- Integration: Indefinite integrals; evaluating the integration constant; the substitution method; trigonometric integrals; definite integrals; the area under a curve; calculating integrals by summation techniques; the Fundamental Theorems of Calculus; and the use of integrals to calculate distance and area.

Course Requirements: Written explanation of problem solutions and writing involving concepts. Discussion and presentation involving concepts and problem solutions in class settings. Competency in the computational aspects of the course. Solutions of problems representing applications of the calculus to other disciplines.

Assessment Instruments: Judgment on student involvement and depth of contributions in class discussions. Competency examination on computational facility. Homework problem and writing assignments. Short quizzes. Hour examinations. Final examination.

Current Textbook: Stewart, **Calculus** 8th Edition, Cengage Learning, 2016.