Tennessee Technological University

Mathematics Department

MATH 1845: Technical Calculus

I. COURSE DESCRIPTION FROM CATALOG:

A survey of differential and integral calculus of functions of a single variable including transcendental functions. Lec. 3. Cr. 3.

II. PREREQUISITE(S):

ACT mathematics score of at least 25 and four years of high school mathematics, including algebra, geometry, trigonometry, and advanced or pre-calculus mathematics; or, special permission of the Mathematics Department; or, C or better in MATH 1730; or, C or better in MATH 1710 and 1720 or equivalent.

III. COURSE OBJECTIVE(S):

This is a survey of elementary differential and integral calculus of functions of a single variable including trigonometric, exponential, and logarithmic functions. Students taking this course are assumed to have a mathematics background of algebra, geometry, and trigonometry. The main objective is to provide the calculus and analytic geometry skills for engineering technology students. Upon completion of this course, students should be able to apply methods of calculus to solving problems in engineering technology and other related areas. Students will use technology, e.g., Matlab (Octave), and/or graphing calculators to analyze data, graphs, and solutions.

IV. STUDENT LEARNING OUTCOMES:

Upon successful completion of the course the student will be able to graphically and algebraically determine limits, derivative and integrals of algebraic, logarithmic, exponential and trigonometric functions; find the equations of tangent and normal lines to various curves; sketch a graph using information from the derivative and limits of a function; utilize the above concepts to solve application problems all within the context of the engineering technology curriculum.

V. TOPICS TO BE COVERED:

1. **Review of Analytic Geometry (6-7 lectures 55 minutes each - 2.5 weeks)**
   a. Functions
   b. Inverse functions including inverse cosine, inverse sine, inverse tangent
   c. Lines including parallel and perpendicular
   d. The parabola, the ellipse, the hyperbola
   e. Translation of axes

2. **The Derivative (7-8 lectures 55 minutes each - 2 weeks)**
   a. The limit
   b. The slope of the tangent line to a curve

c. The derivative of a function
d. Differentiation of polynomials
e. Derivatives of products and quotients
f. The chain rule
g. Higher order derivatives

3. **Applications of the Derivative (6-8 lectures 55 minutes each –-2 weeks)**
   a. Graphs of the derivative function
   b. Maximum and minimum problems
   c. Differentials and linear approximations

4. **Derivatives of Transcendental Functions (6-7 lectures 55 minutes each - < 2 weeks)**
   a. Derivatives of cosine and sine functions
   b. Derivatives of other trigonometric functions
   c. Derivatives of inverse cosine, inverse sine, and inverse tangent functions
   d. Derivatives of exponential functions
   e. Derivatives of logarithmic functions

5. **The integral (5-6 lectures 55 minutes each – < 2 weeks)**
   a. The indefinite integral
   b. Area under the curve
   c. The Fundamental Theorem of Calculus
   d. The definite integral

6. **Methods of Integration (3-4 lectures 55 minutes each – 1 week)**
   a. U-substitution
   b. Integration by parts (optional)
   c. Numerical methods of integration (trapezoidal rule, midpoint rule, Simpson's rule)

which gives 27 topics which can be covered in 33-40 lectures out of about 42 periods MWF in a semester.

VI. ADDITIONAL INFORMATION:

VII. POSSIBLE TEXTS AND REFERENCES:

Calculus Early Transcendentals, 7th edition by James Stewart, or any other calculus book.

Technical Calculus with Analytic Geometry, 4th ed. by Allyn J. Washington, Addison Wesley, (2002) ISBN: 0-201-71112-5

Technical Calculus, 5th ed. by Dale Ewan, Joan S. Gary, James E. Trefzger, Pearson/Prentice Hall (2005) ISBN: 0-13-048818-6

Technical Calculus with Analytic Geometry, 4th ed. by Peter Kuhfittig, Brooks/Cole (2006) ISBN 978-0-0495-01876-6

VIII. ANY TECHNOLOGY THAT MAY BE USED:

Appropriate technology such as Maple, Matlab (Octave) and/or graphing calculators maybe used for in class demonstrations, explorations, and assignments.

IX. STUDENT ACADEMIC MISCONDUCT POLICY:

Maintaining high standards of academic integrity in every class at Tennessee Tech is critical to the reputation of Tennessee Tech, its students, alumni, and the employers of Tennessee Tech graduates. The Student Academic Misconduct Policy describes the definitions of academic misconduct and policies and procedures for addressing Academic Misconduct at Tennessee Tech. For details, view the Tennessee Tech's Policy 217 – Student Academic Misconduct at Policy Central.

X. DISABILITY ACCOMMODATION:

Students with a disability requiring accommodations should contact the Office of Disability Services (ODS). An Accommodation Request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The ODS is located in the Roaden University Center, Room 112; phone 372-6119. For details, view the Tennessee Tech's Policy 340 – Services for Students with Disabilities at Policy Central.