Course Outline for Mathematics 2
CALCULUS II

Catalog Description:
MTH 2 - Calculus II 5.00 units
Continuation of differential and integral calculus, including transcendental, and inverse functions. Techniques of integration, numerical integration, parametric equations, polar coordinates, sequences, power series and Taylor series. Primarily for mathematics, physical science, and engineering majors.
Prerequisite: MTH 1 (completed with a grade of "C" or higher)

Grading Option: Letter Grade

Discipline:

<table>
<thead>
<tr>
<th>Units</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week</td>
</tr>
<tr>
<td>Lecture</td>
<td>5.00</td>
</tr>
<tr>
<td>Laboratory</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>5.00</td>
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</tbody>
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Prerequisite Skills:
None

Measurable Objectives:
Upon completion of this course, the student should be able to:
1. define natural logarithmic function in terms of a Riemann integral;
2. integrate and differentiate logarithmic functions;
3. define and differentiate inverse functions;
4. define an exponential function;
5. differentiate and integrate exponential functions;
6. differentiate and integrate inverse trigonometric functions;
7. solve application problems involving logarithmic, exponential, and inverse trigonometric functions;
8. integrate definite and indefinite integrals using standard techniques of integration such as integration by parts, trigonometric integrals, trigonometric substitution, partial fractions, rational functions of sine and cosine;
9. perform numerical integration using the trapezoidal method and Simpson's rule;
10. graph, differentiate and integrate functions in polar form;
11. evaluate indeterminate forms using L'Hopital's Rule;
12. evaluate improper integrals;
13. graph, differentiate, and integrate functions in parametric form;
14. use integration to solve applications such as work, length of a curve, center of mass, and growth and decay;
15. construct polynomial approximations (Taylor polynomials) for various functions and estimate their accuracy using an appropriate form of the remainder term in Taylor's formula;
16. determine convergence of sequences;
17. apply a variety of tests to determine whether a series converges absolutely, converges conditionally or diverges;
18. determine the radius of convergence and interval of convergence of power series;
19. differentiate and integrate power series;
20. construct (directly or indirectly) power series representations (Taylor series) for various functions, determine their radii of convergence, and use them to approximate function values;
21. solve differential equations using separation of variables.

Course Content:
1. Definition of the natural logarithmic function in terms of a Riemann integral
2. Inverse functions
   A. Definition
   B. Differentiation Rule
3. Application of inverse function theory to define and derive properties of the exponential function from the natural logarithm
4. Differentiation, integration and applications of transcendental functions
   A. Logarithmic
   B. Exponential
   C. Inverse trigonometric
5. Indeterminate forms and L'Hopital's Rule
6. Techniques of integration
   A. By parts
   B. Trigonometric substitution
   C. Trigonometric integrals
   D. Partial fractions
   E. Rational functions of sine and cosine
7. Numerical Integration
   A. Trapezoidal method
   B. Simpson’s Rule
8. Improper integrals
9. Sequences and series
   A. Convergence tests
   B. Power series
      a. Radius of convergence
      b. Interval of convergence
      c. Differentiation
      d. Integration
10. Polynomial approximations: Taylor Polynomial
11. Functions in parametric
   A. Graphing
   B. Differentiation
   C. Integration
12. Functions in polar form
   A. Graphing
   B. Differentiation
   C. Integration
13. Applications
   A. Arc length
   B. Surface of a revolution
   C. Moments and center of mass
   D. Work
   E. Growth and decay
14. Introduction to separable differential equations

Methods of Presentation
1. Lecture/Discussion
2. Audio-visual materials
3. Group Activities
4. Demonstration/Exercise
5. Problem Solving

Assignments and Methods of Evaluating Student Progress
1. Typical Assignments
   A. A ladder 10 feet long leans against a vertical wall. If the bottom of the ladder slides away from the base of the wall at a speed of 2 feet per second, how fast is the angle between the ladder and the wall changing when the bottom of the ladder is 6 feet from the base of the wall?
   B. Describe the motion of a particle with position (x,y) as t varies in the given interval x = 4 – 4t, y = 2t +5, 0 < t < 2
2. Methods of Evaluating Student Progress
   A. Exams/Tests
   B. Quizzes
   C. Homework
   D. Final Examination
3. Student Learning Outcomes
   Upon the completion of this course, the student should be able to:
   A. Critically analyze mathematical problems using a logical methodology.
   B. Communicate mathematical ideas, understand definitions, and interpret concepts.
   C. Increase confidence in understanding mathematical concepts, communicating ideas and thinking analytically.

Textbook (Typical):

Special Student Materials
1. Access code to online learning system may be required.
2. A graphing calculator may be required.

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