LAKELAND COMMUNITY COLLEGE – COURSE OUTLINE FORM*

ORIGINATION DATE:	8/2/99	**APPROVAL DATE:**	2/27/23
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COURSE ID: **MATH2600**
COURSE TITLE: Calculus and Analytical Geometry II

	LECTURE	LAB	CLINICAL	TOTAL	OBR MIN	OBR MAX
CREDITS:	5.00	0.00	0.00	5.00	5.00	5.00
CONTACT HOURS:	5.00	0.00	0.00	5.00		

PREREQUISITE:

MATH 2500 OR PERMISSION OF INSTRUCTOR

COURSE DESCRIPTION:

This is the second course in a three-semester sequence study of differential and integral calculus. Topics include applications of integration, techniques of integration, L'Hopital's rule, improper integrals, sequences, infinite series, power series, Taylor's series, conic sections, parametric equations, polar coordinates, and applications. Students will need to supply a graphing utility; the instructor will provide details.

RATIONALE FOR COURSE:

This is the second course in a three-semester sequence study of differential and integral calculus.

OUTCOMES:
The course will

1. Present the fundamental concepts and basic techniques of differential and integral calculus in a clear and concise manner and at a level suitable for first year engineering, mathematics, and science students.

2. Develop students' ability to apply mathematical abstraction to concrete applications.

3. Develop students' understanding of and ability to use differential and integral calculus as a tool.

4. Develop students' ability to use theorems and definitions in combination.

5. Introduce mathematical abstraction, logical reasoning, the precision of a mathematical argument, and the construction of proofs.

6. Further develop the use of technology as a tool for determining solutions to real-life applications.

7. Demonstrate how Riemann sums are used to develop definite integrals to find the area between two curves, the volume of solids of revolution, arc length, and work.

PERFORMANCE INDICATORS:
Upon completion of the course, the student should be able to

1. Find the area between two curves.

2. Find the volume of a solid of revolution by the Disc/Washer Method and the Shell Method.

3. Find the arc length of a curve.

4. Formulate and evaluate integrals to solve work problems involving a variable force or the movement of a fluid.

6. Integrate using substitution, integration by parts, trigonometric substitution, and partial fractions.

7. Integrate using graphing utilities and/or software.

8. Evaluate limits using L'Hopital's rule.

9. Identify and evaluate improper integrals including integrals defined on infinite intervals and/or integrals where a limit of integration is a discontinuity.

10. State the differences between a sequence and a series.

11. Estimate the limit of a sequence numerically and graphically.

12. Determine whether a sequence converges or diverges, and find its limit.

13. Identify the harmonic series, geometric series, p-series, and alternating series.

14. Determine the convergence or divergence of a series using the nth term test for divergence, integral test, the direct comparison test, the limit comparison test, the alternating series test, the root test, and the ratio test.

15. Identify conditionally convergent and absolutely convergent series.

16. Determine the Taylor polynomial of a given function, and estimate the error incurred by using the polynomial to approximate function values.

17. Determine the power series representation of a given function.

18. Determine the domain (interval of convergence) of a power series representation of a given function and state its radius of convergence.

19. Differentiate and integrate power series, and determine the associated interval of convergence.

20. Approximate the value of a definite integral using power series.

21. Recognize and graph equations of the conic sections.

22. Find expressions for the first and second derivatives of y with respect to x given a parametric description of a curve.

23. Identify intervals over which a curve described parametrically is smooth.

24. Write and evaluate integrals associated with a curve described parametrically to find arc length, surface area of revolution, etc.

25. Graph equations given in polar coordinates and determine tangent line slopes.

26. Find area and arc length in polar coordinates.

COURSE OUTLINE:

I. Applications of Integration
- A. Area of a region between two curves
- B. Volume: The Disc/Washer Method
- C. Volume: The Shell Method
- D. Arc length
- E. Work
- F. Additional applications, for example:
  1. Moments, centers of mass, and centroids
  2. Fluid pressure and fluid force

II. Integration Techniques, L'Hopital's Rule, and Improper Integrals
- A. Basic integration rules and substitution
- B. Integration by parts
- C. Trigonometric integrals
- D. Trigonometric substitution
- E. Partial fractions
- F. Integration with graphing utilities / software
- G. Indeterminate forms and L'Hopital's Rule
  1. The Extended (Cauchy's) Mean Value Theorem (as time permits.)
- H. Improper integrals

III. Infinite Series
- A. Sequences
- B. Series and convergence
  1. The nth term test for divergence
  2. Geometric series
- C. The integral test and p-series
- D. Comparisons of series
  1. Direct comparison test
  2. Limit comparison test
- E. Alternating series
  1. Alternating Series Remainder Theorem
  2. Absolute and conditional convergence
- F. The ratio and root tests
- G. Taylor polynomials and approximations
  1. The Remainder Theorem
- H. Power series
  1. Domain (interval of convergence)
     a. radius of convergence
- I. Representation of functions by power series
  1. Geometric series
  2. New series from old and associated interval of convergence:
     a. multiplication
     b. division
     c. composition
     d. integration and differentiation
- J. Taylor and Maclaurin Series
  1. Maclaurin Series for e^x, sin(x), cos(x), ln(x), arctan(x)
  2. The binomial series

IV. Conics, Parametric Equations, and Polar Coordinates
- A. Conics and calculus
- B. Plane curves and parametric equations
- C. Parametric equations and calculus
- D. Polar coordinates and polar graphs
- E. Area and arc length in polar coordinates

INSTRUCTIONAL PROCEDURES THAT MAY BE UTILIZED:

Lecture/discussion
Computer/graphing calculator based activities
Group and/or individual activities
Research projects utilizing real data gathered from the Internet or other sources

GRADING PROCEDURES:

It is recommended that the instructors have at least five evaluative items on which to determine the student's course grade. In general, tests are given covering lecture and homework assignments.

COURSE EVALUATION PROCEDURES:

Student course evaluations
Student success rate in subsequent mathematics courses

See pages 17-19 of Curriculum Procedures & Guidelines for definitions of course outline terms.

LAKELAND LEARNING OUTCOMES

		I	R	D
	LEARNS ACTIVELY			
1.	Takes responsibility for his/her own learning.			D
2.	Uses effective learning strategies.			
3.	Reflects on effectiveness of his/her own learning strategies.			
	THINKS CRITICALLY	**I**	**R**	**D**
4.	Identifies an issue or idea.			
5.	Explores perspectives relevant to an issue or idea.			
6a.	Identifies options or positions.			
6b.	Critiques options or positions.			
7.	Selects an option or position.			D
8a.	Implements a selected option or position.			
8b.	Reflects on a selected option or position.			
	COMMUNICATES CLEARLY	**I**	**R**	**D**
9a.	Uses correct spoken English.			
9b.	Uses correct written English.			
10.	Conveys a clear purpose.			
11.	Presents ideas logically.			D
12a.	Comprehends the appropriate form(s) of expression.			D
12b.	Uses the appropriate form(s) of expression.			D
13.	Engages in an exchange of ideas.			
	USES INFORMATION EFFECTIVELY	**I**	**R**	**D**
14.	Develops an effective search strategy.			
15a.	Uses technology to access information.			D
15b.	Uses technology to manage information.			
16.	Uses selection criteria to choose appropriate information.			D
17.	Uses information responsibly.			
	INTERACTS IN DIVERSE ENVIRONMENTS	**I**	**R**	**D**
18a.	Demonstrates knowledge of diverse ideas.			
18b.	Demonstrates knowledge of diverse values.			
19.	Describes ways in which issues are embedded in relevant contexts.			
20a.	Collaborates with others.			
20b.	Collaborates with others in a variety of situations.			
21.	Acts with respect for others.			

Definitions:

Introduces (I)

Students first learn about key ideas, concepts, or skills related to the performance indicator. This usually happens at a general or very basic level, such as learning one idea or concept related to the broader outcome.

Reinforces (R)

Students are given the opportunity to synthesize key ideas of skills related to the performance indicator at increasingly proficient levels.

Demonstrates (D)

Students should demonstrate mastery of the performance indicator with the level of independence expected of a student attaining an associate’s degree.