COLLIN COLLEGE EXPANDED GENERIC COURSE SYLLABUS

COURSE INFORMATION

Course Number: MATH 2414
Course Title: Calculus II
Credit Hours: 4
Lecture Hours: 3
Lab Hours: 3

Prerequisite
MATH 2413 with a C or better

Course Description
Differentiation and integration of transcendental functions; parametric equations and polar coordinates; techniques of integration; sequences and series; improper integrals. Lab included.

Textbook/Supplies
Onsite and Online Courses: Calculus: Early Transcendentals, 3rd edition. 2019, Pearson, by Briggs, Cochran, Gillet, Schulz.

Supplies: Graphing calculator required.

STUDENT LEARNING OUTCOMES (SLO)

Upon completion of this course the students should be able to do the following:

1. Solve problems with definite integrals involving area, volume, work and other physical applications. (Critical Thinking/Communication Skills)
2. Develop techniques involving substitution, integration by parts, trigonometric substitution, partial fractions, and tables of anti-derivatives to evaluate definite and indefinite integrals.
3. Define an improper integral. (Communication Skills)
4. Apply the concepts of limits, convergence, and divergence to evaluate some classes of improper integrals.
5. Determine convergence or divergence of sequences and series. (Critical Thinking)
6. Apply Taylor and Maclaurin series to find representations of functions.
7. Apply Taylor or Maclaurin series to integrate functions not integrable by conventional methods.
8. Calculate areas, lengths of curves and representations of conic sections using the concept of polar coordinates.

METHOD OF EVALUATION

Course requirements
Attending class**,** completing homework assignments**,** completing labs, and completing required exams.

Course format
Lecture, lab, and guided practice.

A minimum of four proctored exams and a proctored comprehensive final exam will be given. The final exam must count at least as much as any regular exam. Homework and/or quizzes may be used in place of one exam or in addition to exams. The weight of each of these components of evaluation will be specified in the individual instructor's addendum to this syllabus. All out-of-class course credit, including home assignments, service-learning, etc. may not exceed 25% of the total course grade; thus, at least 75% of a student's grade must consist of proctored exams, and no student may retake any of these exams.

COURSE CONTENT AND MODULE LEARNING OBJECTIVES

Proofs and derivations will be assigned at the discretion of the instructor. The student will be responsible for knowing all definitions and statements of theorems for each section outlined in the following modules.

Module 1: APPLICATIONS OF INTEGRATION

The student will be able to:

1. Construct and evaluate a definite integral to calculate the volume of a solid by slicing. SLO 1
2. Construct and evaluate a definite integral to calculate the volume of a solid of revolution with a definite integral using the disk and washer methods. SLO 1
3. Construct and evaluate a definite integral to calculate the volume of a solid of revolution with a definite integral using the shell method. SLO 1
4. Construct and evaluate a definite integral that calculates the arc length of a curve. SLO 1
5. Construct and evaluate a definite integral that calculates the area of a surface of revolution. SLO 1
6. Construct and evaluate a definite integral to calculate the hydrostatic force acting on a lamina. SLO 1
7. Construct and evaluate a definite integral to calculate the work done by a variable force. SLO 1
8. Construct and evaluate definite integral to calculate mass of a one-dimensional object. SLO 1

Module 2: HYPERBOLIC TRIGONOMETRIC FUNCTIONS

The student will be able to:

1. Define hyperbolic functions and apply them to prove identities.
2. Calculate derivatives of hyperbolic functions and their inverses.
3. Evaluate indefinite and definite integrals of hyperbolic functions and their inverses.

Module 3: TECHNIQUES OF INTEGRATION

The student will be able to:

1. Evaluate definite or indefinite integrals using integration by parts. SLO 2
2. Evaluate definite and indefinite trigonometric integrals. SLO 2
3. Evaluate definite and indefinite integrals using the method of trigonometric substitution. SLO 2
4. Evaluate definite and indefinite integrals using the method of partial fraction decomposition. SLO 2
5. Identify and use the necessary technique and to evaluate a definite or indefinite integral. SLO 2
6. Recognize the correct formula to evaluate definite and indefinite integrals from a table. SLO 2
7. Approximate definite integrals using the Trapezoidal, Midpoint, and Simpson's rules.
8. Determine whether an improper integral converges or diverges. SLO 3 & SLO 4

Module 4: DIFFERENTIAL EQUATIONS

The student will be able to:

1. Choose an appropriate model for a differential equation problem.
2. Determine if a given function is a solution to a differential equation.
3. Use direct integration to solve basic general and initial value differential equations.
4. Identify a direction field for differential equation.
5. Sketch the solution curve on a direction field for a differential equation given an initial value.
6. Approximate solutions to initial value problems using Euler's method.
7. Solve separable differential equations for their general and initial value solutions.
8. Construct and solve separable differential equations used in applications, including Exponential and Logistic Growth.
9. Solve first-order linear differential equations and applications. (OPTIONAL)

Module 5: SEQUENCES AND INFINITE SERIES

The student will be able to:

1. Define and analyze infinite sequences and their limits. SLO 5
2. Define and analyze infinite series to determine their convergence and divergence, including geometric series. SLO 5
3. Recognize when to use and how to apply the Test for Divergence. SLO 5
4. Recognize when to use and how to apply the Integral Test combined with the Remainder Estimate to estimate the sum of a series. SLO 5
5. Determine the convergence or divergence of a *p*-series. SLO 5
6. Recognize when to use and how to apply the Direct and Limit Comparison Tests. SLO 5
7. Recognize when to use and how to apply the Alternating Series Test combined with the Alternating Series Estimation Theorem. SLO 5
8. Distinguish between absolute and conditional convergence and apply the Ratio and Root Tests. SLO 5
9. Perform series convergence tests strategically to determine convergence or divergence of a given series. SLO 5

Module 6: POWER SERIES

The student will be able to:

1. Approximate functions with Taylor polynomials. SLO 6
2. Examine power series to find the radius, interval, and center of convergence. SLO 6
3. Derive a power series representation for a given function. SLO 6
4. Produce Taylor and Maclaurin series for a given function to integrate and calculate limits. Analyze binomial series. SLO 7

Module 7: PARAMETRIC EQUATIONS AND POLAR COORDINATES

The student will be able to:

1. Derive and sketch parametric equations for plane curves.
2. Perform calculus with parametric curves: find slope, tangent lines, and arc length.
3. Review and analyze the polar coordinate system by plotting points, sketching curves, and converting polar coordinates to and from rectangular coordinates. SLO 8
4. Perform calculus with polar curves: find slope, area, and arc length. SLO 8