Las Positas College
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Course Outline for MATH 2

CALCULUS II

Effective: Fall 2019

I. CATALOG DESCRIPTION:
MATH 2 — CALCULUS II — 5.00 units

Continuation of single-variable differential and integral calculus. Topics covered include: inverse and hyperbolic functions; techniques of integration; polar and parametric equations; infinite sequences, series, power series and Taylor series; applications of integration. Primarily for mathematics, physical science and engineering majors.

5.00 Units Lecture

Prerequisite
MATH 1 - Calculus I
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:
- Mathematics

	MIN
Lecture Hours:	90.00
Expected Outside of Class Hours:	180.00
Total Hours:	270.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. MATH1
1. Evaluate the limit of a function at a real number;
2. Determine whether a function is continuous at a point or an interval;
3. Find and interpret average and instantaneous rates of change;
4. Interpret the derivative as the slope of a tangent line and find the equation of a tangent line to a function;
5. State and apply the rules for differentiating algebraic and trigonometric functions.
6. Utilize the chain rule when differentiating functions;
7. Use calculus-based methods to analyze functional behavior;
8. Find all maxima, minima and points of inflection of a function;
9. Use implicit differentiation;
10. Evaluate the limit of a function at infinity;
11. Evaluate a definite integral as the limit of a Riemann sum;
12. Apply the Fundamental Theorem of Integral Calculus;
13. Evaluate integrals by the method of substitution;
14. Find areas between curves and volumes of solids of revolution;

IV. MEASURABLE OBJECTIVES:

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

A. Graph, differentiate, and integrate inverse functions and transecdental functions such as trigonometric, exponential and logarithimic functions;
B. Evaluate limits by applying L'Hospital's rule and techniques appropriate to limits of indeterminate forms;
C. Evaluate definite and indefinite integrals by a variety of integration techniques;
D. Apply numerical methods to approximate definite integrals;
E. Evaluate improper integrals;
F. Use integration to solve applications such as work, arc length and the surface area of a solid of revolution;
G. Solve separable first order differential equations;
H. Solve exponential growth and decay problems;
I. Graph, differentiate and integrate functions in polar and parametric form;
J. Determine convergence or divergence of an infinite sequence;

K. Determine convergence of divergence of an infinite series, alternating or non-alternating, by applying tests for convergence;
L. Estimate the sum of a convergent series;
M. Determine convergence or divergence of a power series, and find the radius and interval of convergence;
N. Find the radius and interval of convergence;
O. Apply theorems for differentiation and integration of a power series;
P. Find Taylor and Maclaurin series for a given function;
Q. Use the binomial series to find a power series of a function;

V. CONTENT:
- A. Transendental functions
  1. Exponential functions
     a. Differentiation
     b. Integration
  2. Logarithmic functions
     a. Differentiation
     b. Logarithmic differentiation
     c. Integration
- B. Inverse trigonometric functions
  1. Domain and range
  2. Graphs
  3. Differentiation
  4. Antiderivatives and integration formulas
- C. Hyperbolic functions
  1. Definitions and graphs
  2. Identities
  3. Differentiation
  4. Antiderivatives and integration formulas
  5. Inverse hyperbolic functions
  6. Differentiation
  7. Antiderivatives and integration formulas
- D. Indeterminate forms
  1. Types of indeterminate forms
  2. L'Hospital's rule
  3. Techniques for evaluating limits of indeterminate forms
- E. Techniques of integration
  1. Substitution
  2. Inverse trigonometric function integration formulas
  3. Integration by parts
  4. Products of trigonometric functions
  5. Trigonometric substitution
  6. Partial fraction decomposition
  7. Table of Integrals
- F. Numerical methods of integration
  1. Midpoint rule
  2. Trapezoidal rule
  3. Simpson's rule
  4. Error analysis
- G. Improper integrals
- H. Applications of integration
  1. Arc length
  2. Surface area of a solid of revolution
  3. Moments and center of mass
  4. Work
- I. Separable first order differential equations
- J. Exponential growth and decay
- K. Parametric curves and equations;
  1. Curve sketching and direction of motion
  2. Elimination of a parameter
  3. Calculus with parametric curves
     a. Slope of a tangent line
     b. Area
     c. Arc length
- L. Polar curves and equations;
  1. Polar coordinates
  2. Curve sketching
  3. Calculus with polar curves
     a. Slope of tangent line
     b. Area
     c. Arc length
- M. Infinite sequences
  1. Definition
  2. Geometric sequence
  3. Convergence
  4. Divergence
- N. Infinite series
  1. Geometric series
  2. Telescoping series
  3. p-series
  4. Alternating series
  5. Tests for convergence or divergence
     a. nth term divergence test
     b. Integral test
     c. p-series test
     d. Comparison tests
     e. Alternating series test
     f. Ratio and root tests
  6. Sum of a convergent series
- O. Power series
  1. Definition

2. Power series representation of a function
3. Tests for convergence
4. Radius and interval of convergence
5. Applications
6. Binomial series

P. Taylor and Maclaurin series
1. Definition
2. Finding the Taylor or Maclaurin series representation of a function
3. Taylor's inequality

VI. METHODS OF INSTRUCTION:

A. **Discussion** -
B. **Lecture** -
C. Web- or CD-Rom-based tutorials
D. Student presentations
E. Collaborative learning

VII. TYPICAL ASSIGNMENTS:

A. Homework
1. Homework should be assigned from the text and should include a sufficient number and variety of problems to develop both skill and conceptual understanding. Problems should range in level of difficulty from introductory level to challenging. A typical assignment should take an average student 1 to 2 hours for each hour in class.

B. Collaborative learning
1. Collaborative learning, done in small groups of 2-4 students, can be used to introduce new concepts, build skills, or teach problem solving. Students may be asked to present their results on the board.
2. Example collaborative learning assignment: Have each group solve a curve-sketching problem and then present their work to the rest of the class, explaining the process they used and their results.

VIII. EVALUATION:

Methods/Frequency

A. Exams/Tests
minimum 4 exams and a comprehensive final exam

B. Quizzes
Announced or unannounced, in-class or take home at the discretion of the instructor

C. Home Work
Assigned for each section covered

IX. TYPICAL TEXTS:

1. Briggs, W., Cochran, L., & Gillett, B. (2015). *Calculus* (2nd ed.). Boston, MA: Pearon.
2. Hass, J.R., Heil, C.D., & Weir, M.D. (2017). *Thomas' Calculus: Early Transcendentals* (14th ed.). Boston, MA: Pearson.
3. Stewart, J. (2016). *Calculus* (8th ed.). Boston, MA: Cengage.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. Graphing calculator may be required