

Course Outline

COURSE: MATH 2C **DIVISION:** 10 **ALSO LISTED AS:**

TERM EFFECTIVE: Spring 2015 **CURRICULUM APPROVAL DATE:** 09/22/2014

SHORT TITLE: DIFFERENTIAL EQUA

LONG TITLE: Differential Equations

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
3	18	Lecture:	3	54
		Lab:	0	0
		Other:	0	0
		Total:	3	54

COURSE DESCRIPTION:

An introductory course in differential equations that covers: first order differential equations including separable, linear, exact, homogeneous, bernoulli and Euler's Method; second order differential equations including homogeneous, nonhomogeneous, variation of parameters, method of undetermined coefficients and reduction of order; series solutions to differential equations; Laplace Transforms; linear systems; and if time, Fournier Analysis; and applications thereof. **PREREQUISITE:** Mathematics 1C with a grade of 'C' or better.

PREREQUISITES:

Completion of MATH 1C, as UG, with a grade of C or better.

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

02 - Lecture and/or discussion

STUDENT LEARNING OUTCOMES:

1. Formulate, analyze and solve differential equations of first, second, and higher order equations involving linear, separable, exact, homogeneous, linear systems, Euler's numerical, method of

undetermined coefficients, variation of parameters, reduction of order, Laplace Transforms, series solutions, and Fourier Analysis;

Measure: homework, written exam, quizzes and projects

PLO: 1

ILO: 2

GE-LO: B3, B7

Year Assessed: 2011-2012

2. Solve applied problems encountered in engineering, physics, and other physical sciences, working both in groups and individually.

Measure: homework, written exam, quizzes and projects

PLO: 2, 1

ILO: 2

GE-LO: B3

Year Assessed: 2015

3. Use the Existence and Uniqueness Theorem to determine whether a solution to a differential equation exists and is unique. Compute Wronskian to determine whether two solutions are dependent or independent.

Measure: homework, written exam, quizzes and projects

PLO: 2,

ILO: 2

GE-LO: B3, B7

Year Assessed: 2015

4. Use technology to find numerical approximations to differential equations and to analyze d.e. problems and solutions.

Measure: homework, written exam, quizzes and projects

PLO: 2,1

ILO: 2

GE-LO: B4, B7

Year Assessed: 2015

PROGRAM LEARNING OUTCOMES:

1. Identify and utilize appropriate mathematical operations in the simplification of expressions and solution of equations.
2. Compare and contrast various mathematical models and then apply the appropriate model to real world problems.
3. Describe, compare and contrast various mathematical functions using everyday language.

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 09/22/2014

CONTENT: Basic definitions, terminology and the origins of differential equations. Checking the solution of differential equations (from here on out referred to as d.e.s or d.e. if singular).

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will identify the order of a differential equation, whether it is linear or not, and verify a solution to a differential equation.

CONTENT: Separable d.e.s, general vs. specific solution, family of curves.

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will find and analyze general and specific solutions to separable d.e.s. and use technology to graph and analyze the family of solutions.

CONTENT: Linear d.e.s., Modeling with d.e.s.

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will solve linear d.e.s. Student will solve population, solution mixture and other applied problems.

CONTENT: Bernoulli, variation of parameters d.e.s.

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will identify and solve Bernoulli and variation of parameter problems.

CONTENT: Exact, Integrating factors

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will solve exact d.e.s. and find integrating factors to make a differential equation exact.

CONTENT: Homogeneous, Euler's Method

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will determine if a d.e. is homogeneous and then solve. Student will use technology to find the numerical solution to a initial value problem using Euler's Method.

CONTENT: D.e.s. of higher order : Homogeneous linear equations with constant coefficients, characteristic equations with real roots

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will find solutions to second order homogeneous d.e.s. where the characteristic equation has two distinct real roots. Student will also solve such problems when initial conditions are given and analyze the solution under various conditions.

CONTENT: Reduction of Order, complex roots

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will solve second order homogeneous d.e.s. where the characteristic equation has repeated roots and complex roots, and analyze the solution graphically.

CONTENT: Euler equations, equations with dependent or independent variables missing

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will identify and solve Euler equations and equations with dependent and independent variables missing, and analyze the solution.

CONTENT: Change of variables, Solutions to nonhomogeneous d.e.s. using methods of undetermined coefficients.

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will be able to solve d.e.s. using change of variable technique. Student will solve non-homogeneous equations using method of undetermined coefficients.

CONTENT: Variation of Parameters, applications of 2nd order d.e.s. - simple-, damped-, and forced-harmonic motion.

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will solve 2nd order non-homogeneous equation using variation of parameters. Student will solve simple-, damped- and forced harmonic motion problems by setting up and solving 2nd order des.

CONTENT: Review of power series, solving des using series solutions about an ordinary point

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will to solve a differential equation by means of a power series about an ordinary point .

CONTENT: Regular and irregular points, Euler Equations

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will identify singular points of d.e.s. and show whether they are regular or irregular, and solve the Euler differential equation.

CONTENT: Laplace transforms.

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Students will to find the Laplace transform of a given function.

CONTENT: Inverse transforms and the operational properties of Laplace transforms.

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will find the inverse of the Laplace transform of a given function and solve d.e.s. using Laplace transforms.

CONTENT: Applications of the Laplace transform, Fourier series

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Students will find Laplace transform and Fourier series of step and piecewise functions and other discontinuous functions.

CONTENT: More systems of d.e.s. including systems of linear first-order equations. Review for final exam

HOURS: 3

HOMEWORK: Read sections of the book and complete problems assigned.

STUDENT PERFORMANCE OBJECTIVES: Student will solve a system of first order d.e.s.

Final Exam

METHODS OF INSTRUCTION:

Lecture/discussion and computer demonstrations. Regularly scheduled, full-period, problem-solving written exams will be given throughout the semester. Homework will be inspected on a regular basis. Extra credit will be given for class participation.

METHODS OF EVALUATION:

CATEGORY 1 - The types of writing assignments required:

Percent range of total grade: 0 % to %

If this is a degree applicable course, but substantial writing assignments are not appropriate, indicate reason:

Course is primarily computational

CATEGORY 2 -The problem-solving assignments required:

Percent range of total grade: 85 % to 95 %

Homework Problems

Quizzes

Exams

CATEGORY 3 -The types of skill demonstrations required:

Percent range of total grade: 0 % to %

CATEGORY 4 - The types of objective examinations used in the course:

Percent range of total grade: 0 % to %

CATEGORY 5 - Any other methods of evaluation:

Percent range of total grade: 5 % to 15 %

Group Projects

REPRESENTATIVE TEXTBOOKS:

Required:

Boyce and DiPrima Elementary Differential Equations and Boundary Value Problems 10th Ed. Wiley 2012, or other appropriate college level text.

ISBN: 978-0-470-45831-0

Reading level of text, Grade: 16 Verified by: Ken Wagman

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B4, effective 200530

CSU GE:

CSU B4, effective 200530

IGETC:

IGETC 2A, effective 200530

CSU TRANSFER:

Transferable CSU, effective 200530

UC TRANSFER:

Transferable UC, effective 200530

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: A

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN: MATH24

CAN Sequence: XXXXXXXX

CSU Crosswalk Course Department: MATH

CSU Crosswalk Course Number: 2C

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: E

Maximum Hours:

Minimum Hours:

Course Control Number: CCC000215283

Sports/Physical Education Course: N

Taxonomy of Program: 170100