**MATH 2 Course Outline as of Fall 2021**

# CATALOG INFORMATION

Dept and Nbr: MATH 2 Title: CALCULUS 4
Full Title: Calculus, Fourth Course-Differential Equations
Last Reviewed: 11/28/2022

| Units | | Course Hours per Week | | Nbr of Weeks | Course Hours Total | |
|---|---|---|---|---|---|---|
| Maximum | 3.00 | Lecture Scheduled | 3.00 | 17.5 | Lecture Scheduled | 52.50 |
| Minimum | 3.00 | Lab Scheduled | 0 | 8 | Lab Scheduled | 0 |
| | | Contact DHR | 0 | | Contact DHR | 0 |
| | | Contact Total | 3.00 | | Contact Total | 52.50 |
| | | Non-contact DHR | 0 | | Non-contact DHR | 0 |

Total Out of Class Hours: 105.00 Total Student Learning Hours: 157.50

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| Title 5 Category: | AA Degree Applicable |
| Grading: | Grade Only |
| Repeatability: | 00 - Two Repeats if Grade was D, F, NC, or NP |
| Also Listed As: | |
| Formerly: | MATH 2B |

**Catalog Description:**
First and second order differential equations with applications, series solutions, numerical methods, introduction to Laplace transforms, systems of differential equations with applications.

**Prerequisites/Corequisites:**
Course Completion of MATH 1C

**Recommended Preparation:**

**Limits on Enrollment:**

**Schedule of Classes Information:**
Description: First and second order differential equations with applications, series solutions, numerical methods, introduction to Laplace transforms, systems of differential equations with applications. (Grade Only)
Prerequisites/Corequisites: Course Completion of MATH 1C
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;UC.

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

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|---|---|---|---|---|
| **AS Degree:** | **Area** | | Effective: | Inactive: |
| | B | Communication and Analytical Thinking | Fall 1981 | |
| | MC | Math Competency | | |
| **CSU GE:** | **Transfer Area** | | Effective: | Inactive: |
| **IGETC:** | **Transfer Area** | | Effective: | Inactive: |

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|---|---|---|---|---|---|
| **CSU Transfer:** | Transferable | Effective: | Fall 1981 | Inactive: | |
| **UC Transfer:** | Transferable | Effective: | Fall 1981 | Inactive: | |

**CID:**
CID Descriptor: MATH 240 Ordinary Differential Equations
SRJC Equivalent Course(s): MATH2

**Certificate/Major Applicable:**
Major Applicable Course

## COURSE CONTENT

**Student Learning Outcomes:**
At the conclusion of this course, the student should be able to:
1. Identify and solve ordinary differential equations and initial value problems using analytical and numerical methods.
2. Identify and solve systems of differential equations.
3. Model and solve applied problems using differential equations and systems of differential equations.

**Objectives:**
Students will be able to:
1. Classify differential equations as to order, type, and kind.
2. Use slope fields to provide a qualitative analysis of the solutions to a differential equation.
3. Solve homogeneous and exact first-order linear differential equations, including initial value problems.
4. Solve separable first-order differential equations, including initial value problems.
5. Apply the existence and uniqueness theorems for ordinary differential equations.
6. Use the Wronskian to identify sets of fundamental solutions to higher order linear differential equations.
7. Solve homogeneous and non-homogeneous linear differential equations of second and higher order using various techniques such as variation of parameters, undetermined coefficients and the annihilator method.
8. Solve ordinary differential equations using numerical methods such as Euler's method and the method of Runge-Kutta.
9. Apply techniques of solving differential equations and initial value problems to at least three out of the five following applications.
    a) mixture problems
    b) electrical circuits

c) population modeling
d) inductance, resistance and capacitance, LRC circuits
e) forced oscillations

10. Solve initial value problems using the methods of Laplace transforms.
11. Solve systems of differential equations.
12. Solve differential equations using power series methods.

**Topics and Scope:**

I. Ordinary Differential Equations
A. Linear differential equations with applications
B. Separable differential equations
C. Slope fields
D. Existence and uniqueness of solutions
E. Use of Wronskian
F. Numerical methods including 4th order Runge-Kutta

II. Introduction to Laplace Transforms
A. Laplace transform and inverse
B. Use of tables
C. Application to linear differential equations

III. Series Solutions to Differential Equations
A. Power series solutions
B. Taylor series solutions

IV. Systems of Differential Equations
A. Analysis of phase portraits
B. Solution by matrices
C. The operator method or Laplace transforms
D. Use of systems to solve higher order linear ordinary differential equations
E. Applications
1. Coupled spring-mass systems
2. Compartment analysis
3. Other applications

**Assignment:**

1. Daily reading outside of class (20-50 pages per week)
2. Problem set assignments from required text(s) or supplementary materials chosen by the instructor (1-6 per week)
3. Quizzes (0-4 per week)
4. Exams (2-7 per term)
5. Final Exam
6. Projects (for example, computer explorations or modeling activities, 0-10 per term)

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

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| None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course. | Writing<br>0 - 0% |

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

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| Problem set assignments | Problem solving<br>5 - 20% |

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

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| None | Skill Demonstrations<br>0 - 0% |

**Exams:** All forms of formal testing, other than skill performance exams.

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| Quizzes, exams, final exam | Exams<br>70 - 95% |

**Other:** Includes any assessment tools that do not logically fit into the above categories.

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| Projects | Other Category<br>0 - 20% |

**Representative Textbooks and Materials:**
Differential Equations and Boundary Value Problems, Computing and Modeling, 5th ed. Edwards, C. and Penney, David and Calvis, David. Pearson Education. 2018
A First Course in Differential Equations. 11th ed. Zill, Dennis. Cengage Learning. 2018
Elementary Differential Equations. 8th ed. Rainville, Earl and Bedient, Phillip and Bedient, Richard. Pearson. 1997 (classic)