# MATH 055 Differential Equations Spring 2026
# 35749 MW 9:45 – 11:50 am R-109 4 units

**Instructor:** Dr. Matt Henes **E-mail:** mthenes@pasadena.edu **Phone:** (626) 585-7456
**Office:** V-216F **Office Hours:** M-Th 9-9:30 in V-216F; MW 1-2:45 Zoom ID 310 291 0470

**Text:** "A First Course in Differential Equations with Modeling Applications," 11th ed. by Zill with WebAssign ISBN 978-1-305-96572-0. Available at the PCC bookstore or through Cengage.

**Prerequisite:** Math 005B or Math 005BH.

**Course description:** Ordinary first-and higher-order differential equations and modeling with applications to biological and physical sciences. Linear and nonlinear equations, initial-value problems, series solutions, Laplace transforms, systems of linear equations, and numerical solutions.

**Student Learning Outcomes:** Upon successful completion of this course you will be able to:

1. Apply the appropriate analytical technique for finding the solution of first-order ordinary differential equations
2. Apply the appropriate analytical technique for finding the solution of higher-order ordinary differential equations
3. Create and analyze mathematical models using ordinary differential equations
4. Solve linear systems of ordinary differential equations

**Course Content:** Lectures, assignments, and assessments will be based on most of chapters 2-9.

**Required Materials:**

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| Pencils | 1 ½" (or larger) binder with dividers |
| Eraser(s) | OR in lieu of the above, a tablet device |
| Lined paper | Scientific calculator |

**Homework (15% of your grade):** The best way to learn math is to do it. Homework is your opportunity to practice working problems and learn the math you'll see in class. Homework for this course is assigned through WebAssign, so a WebAssign access code is required. This can be purchased from the PCC bookstore or directly through Cengage. Math tends to build on itself – so one of the best ways to be successful in this course is to do homework regularly and complete assignments on time. Though homework represents a relatively small portion of your overall grade, it is when most of your learning will happen; the time you spend on assignments each week is an investment toward ensuring success on exams. Your three lowest homework scores will be dropped (this is about 10 percent of the homework assignments for the course).

**Exams (60% of your grade):** Exams are your opportunity to show what you've learned in this course, so they account for the largest portion of your grade. In this class, we'll have four exams, each of which will include material from 1-2 chapters. I've included exam dates on the course schedule, and I ask that you please take them into account when planning out your semester. Arranging for make-up tests can be challenging, so optimally, everyone will take exams in class as scheduled. If something comes up, I'll consider make-ups for missed exams on a case-by-case basis. Because exams are intended to reflect what you've learned, and because this course is intended to prepare you for future STEM classes, all exam scores will be included in your final grade.

**Comprehensive Final Exam (25% of your grade): Wednesday, June 10, 10:15 - am 12:15 pm**
The final includes material from throughout the course, so when you prepare for the exam, you'll be able to reinforce the concepts you've learned throughout the term. To pass the class, you are required to take the final exam.

**Academic Dishonesty:** Academic integrity is important to ensure that the grades I submit are meaningful. Unfortunately, I need to address cheating. Any student caught cheating on an exam will receive a grade deduction for the exam and can possibly receive a score of zero for that exam. I am required to report the violation to the Office of Student Life for potential further action. According to PCC policy, any form of academic dishonesty can be grounds for receiving a grade of F and possibly dismissal from the college. Please make sure you have an official photo ID, as it will be checked during this class to verify that students in the class are those who are officially enrolled.

**Calculators:** Use of scientific calculators will be allowed on exams. Use of any other electronic device will be considered cheating.

**Assigned grades** are based on performance on exams and homework, not on extra credit or external factors such as GPA and transfer. Course grades will be no lower than those shown below.
A: 90-100% B: 80-89% C: 73-79% D: 60-72% F: below 60%

**Canvas:** Class notes and grades will be recorded on Canvas. Please let me know of any discrepancies or mistakes in posted scores within one week of being posted so I can correct them in a timely manner.

**Attendance/Classroom Policies:**

- Attend regularly
- Arrive on time
- Don't leave early
- Silence cell phone
- No food or drinks except bottled water
- No visitors (including children)

**Additional Information:** Tutoring is available at the Math Success Center (R-406), as well as the Zone for athletes (GM-112A). The office of Disabled Student Programs and Services (D-209) provides support for students with documented disabilities; please let me know of any accommodations for which you qualify.

**Important Dates:**
3/1 Last Day to Add or Drop Without a "W"
3/31 Cesar Chavez Day (no classes)
4/13-18 Spring Break (no classes)
5/15 Last Day to Drop With a "W"
5/25 Memorial Day (no classes

# Math 055 Course Outline

**Student Performance Objectives**

1a. Identify the type of a given first-order differential equation
1b. Apply the existence and uniqueness theorems for first-order ordinary differential equations
1c. Find solutions to separable, linear, and exact ordinary differential equations and Bernouli's equation by separation of variables, substitutions, and numerical (including Euler's) methods
1d. Solve ordinary first-order initial-value differential equations

2a. Identify the type of a given higher-order differential equation
2b. Apply the existence and uniqueness theorems for higher-order ordinary differential equations
2c. Solve ordinary higher-order homogeneous and nonhomogeneous differential equations by reduction of order, undetermined coefficients, variation of parameters, elimination, and Laplace transforms
2d. Find power series solutions to ordinary differential equations
2e. Solve ordinary higher-order initial-value and boundary-value problems
2f. Determine the Laplace transform and inverse Laplace transform of functions and use them to solve differential equations

3a. Use first-order ordinary differential equations to develop mathematical models involving exponential growth and decay, mixtures, logistic growth, and circuits
3b. Use higher-order ordinary differential equations to develop mathematical models involving damped and undamped spring/mass systems and circuits
3c. Examine, solve, and interpret results obtained from these mathematical models.

4a. Apply the existence and uniqueness theorems for systems of linear first-order ordinary differential equations
4b. Find eigenvalues and eigenvectors of linear systems
4c. Apply the methods of undetermined coefficients and variation of parameters to linear systems

**Course Content Outline**

**Solutions to first-order ordinary differential equations**
Separable equations/separation of variables
Homogeneous equations
Exact equations
Linear differential equations
Direction fields (slope fields)
Existence and uniqueness theorems
Substitutions
Numerical (including Euler's) methods
Initial-value problems
Bernouli's equation
First-order difference equations

**Applications of first-order differential equations**
Exponential growth and decay
Mixtures
Logistic growth
Circuits

**Second- and higher-order differential equations**
Homogeneous equations
Fundamental solutions
Independence
Wronskian of functions
Nonhomogeneous equations
Reduction of order
Undetermined coefficients
Variation of parameters
Elimination
Higher-order initial-value problems
Boundary-value problems
Cauchy-Euler equation
Runge-Kutta method

**Applications of higher-order differential equations**
Damped spring/mass systems
Undamped spring/mass systems
Circuits

**Power series solutions**
Solutions about ordinary and singular points
Bessel's Equation
Legendre's Equation
Method of Frobenius

**Laplace transforms**
Transforms and inverse transforms
Initial-value problems
Properties of Laplace transforms—shifts and convolutions

**Systems of ordinary differential equations**
Homogeneous linear systems
Eigenvalues
Eigenvectors
Wronskian and linear independence of a homogeneous linear system
Nonhomogeneous linear systems
Undetermined coefficients
Variation of parameters