MATH 055 Differential Equations Fall 2026
74942 MW 1:15 – 3:20 pm R-320 4 units

Instructor: Dr. Matt Henes **E-mail:** mthenes@pasadena.edu **Phone:** (626) 585-7456
Website: www.matthenes.com **Office:** V-216F
Office Hours: MW 11:30-12:45 pm in V-216F; TTh 5-6 pm via Zoom 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:

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 you'll need to purchase access from the PCC bookstore or directly from Cengage by going to GentEnrolled.com. Use Class Key **pasadena 5960 3892** to access my course. Math tends to build on itself , and one of the best ways to be successful in this course is to do homework regularly and complete assignments on time. Most assignments will be due on Friday and will close at 11:59 on the day they are due. 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 four 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 unit exams that will be delivered via email. You'll receive an email with a link to an online exam. You'll submit your work for each problem by uploading a picture of your paper or a screen shot of your tablet device. Each chapter exam is scheduled on a Monday; the dates are **Mon 9/14 (Ch 2, 3)**, **Mon 10/12(Ch 4, 5)**, **Mon 11/9 (Ch 8, 6)**, and **Mon 11/30 (7.1-7.5)**. Please make a note of these dates. I have chosen not to use proctoring software (such as Proctorio). You are expected to complete exams without any reference material (such as notes or the textbook) and to complete exams without any

assistance from anyone. You're on the honor system for unit exams. 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.

Final Exam (25% of your grade): Wednesday, December 9, 3:15 – 5:15 pm R-108 (PCC campus)
The final includes material from throughout the course (that's Ch 2 – Ch 8), 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 earn a score of 60% or better on the final exam. If you're able to pass all of the exams you take at home, unsupervised, but then fail the in-person final exam with a score of 60% or lower, this will be taken as evidence of cheating, and your grade for the course will be F. In order to maintain standards I have for education and that we have here at PCC, I can't allow any exceptions to the final exam minimum score requirement or that the final must be taken in person. In addition, I'll need to check your photo ID during the final exam session. Examples of acceptable forms of ID are your PCC ID, a driver license, and a passport. If I'm unable to verify your ID, then I can't assign a passing grade for the class.

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. On a personal note, I have put a great deal of time and effort to ensure that this course has all the instruction you need and that my exams align with the work I demonstrate and that I assign for your homework. Please do not dishonor my effort by with academic dishonesty or cheating.

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.

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:
9/7 Last Day to Add or Drop Without a "W"
9/7 Labor Day (no classes)
11/11 Veterans Day (no classes)
11/13 Last Day to Drop With a "W"
11/26-11/29 Thanksgiving Break (no classes)

Math 055 Course Outline

Student Performance Objectives (numbering corresponds to Student Learning Outcomes)

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 Bernoulli'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
Bernoulli'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