

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; W 4-5 pm and 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

Eraser(s)

Lined paper

1 ½" (or larger) binder with dividers

OR in lieu of the above, a tablet device

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 1578 3237](#)** to access my course. 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. Most assignments will be due on Thursday and Sunday 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 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, tentatively scheduled for **Mon 9/14 (Ch 2, 3)**, **Mon 10/12 (Ch 4, 5)**, **Wed 11/4 (Ch 8, 6)**, and **Mon 11/30 (7.1-7.5)**. I ask that you please take these into account when planning your personal schedule. 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.

Final Exam (25% of your grade): Monday, December 7, 1 - 3 pm

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 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 (such as a PCC ID card, a driver license, or a passport), as it will be checked during this class to verify that students in the class are those who are officially enrolled. If I'm unable to verify your ID, then I can't assign a passing grade for the class.

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:

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