# Math 4B: Differential Equations — Winter 2022


INSTRUCTOR Paul J. Atzberger — Department of Mathematics
http://teaching.atzberger.org
*Office Hours*: TR 3:15pm – 4:15pm — *Office Hours Location:* outside CHEM 1179.


CLASS TIMES TR 2:00pm – 3:15pm.
CHEM 1179

DESCRIPTION This class will cover core topics in differential equations on both the theoretical foundations and practical aspects of how to solve applied problems. More information can be found below and on the course website.

PREREQUISITES See the department of mathematics website for current policies.

TEXTBOOKS *Elementary Differential Equations, (11th Edition), W. E. Boyce, R. C. DiPrima, D. B. Meade*.

GRADING

| | |
|---|---|
| Homework | 30% |
| Midterm I | 20% |
| Midterm II | 20% |
| Final Exam | 30% |

POLICIES Assignments will be posted on the course website. Prompt submission of all homework will be required. While no late homework will be accepted, two missed homework will be allowed without penalty. While it is permissible for you to discuss materials with classmates, the submitted homework must be your own work.

Given the large class size, if an exam is missed because of illness or some other emergency, you need to contact the instructor within one week with proper documentation or else a 0 grade may be recorded.

There is a policy of no video or pictures to be taken during lectures. Instead one should take notes or pay particular attention. There is also a policy of no texting, e-mailing, or social media during the class. It is hoped one is avoiding such distractions to make the most of the lectures.

EXAMS

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|---|---|---|
| Midterm I Exam: | Tuesday, January 25, | 2:00pm – 3:15pm. |
| Midterm II Exam: | Thursday, February 17, | 2:00pm – 3:15pm. |
| Final Exam: | Tuesday, March 15, | 4:00pm - 7:00pm. |

TOPIC AREAS

- Introduction
  - Types of differential equations.
  - Classification of Equations.
  - Applications.

- First-Order Linear Equations
  - Methods of Integrating Factors.
  - Separable Equations.
  - Existence/Uniqueness
  - Direction Fields Approach.
  - Linear/Nonlinear and Autonomous Equations.
  - Numerical Techniques: Euler's Method and Other Approaches.

- Second-Order Linear Equations
  - Case with Distinct Real Roots.
  - Existence and Uniqueness Theory.
  - Wronskians and Fundamental Solution Sets.
  - Case with Two Imaginary Roots.
  - Case with Repeated Roots.
  - Nonhomogeneous Methods.
  - Applications to Mechanical of Vibrations.

- Higher-Order Linear Differential Equations
  - Wronskians and Fundamental Solution Sets.
  - Existence and Uniqueness Theory.
  - Nonhomogeneous, Undetermined Coefficients.
  - Reduction of Order.
  - Nonhomogeneous, Variation of Parameters.

- Systems of Linear Equations
  - Matrix Form of Equations.
  - Eigenvalues and Eigenvectors Approaches.
  - Imaginary Eigenvalues.
  - Repeated Eigenvalues.
  - Trajectories in the Phase Plane.
  - Direction Fields Approaches.
  - Nonhomogeneous Systems.
  - Boundary Value Problems.

WEBSITE http://teaching.atzberger.org