Introduction to Differential Equations and Applications

Department: Fudan International Winter Session 2026

<table>
<tr><td>Course Code</td><td colspan="7">MATH10038</td></tr>
<tr><td>Course Title</td><td colspan="7">Introduction to Differential Equations and Applications</td></tr>
<tr><td>Credit</td><td>2</td><td>Experiment (including Computer) Credit</td><td>0</td><td>Practice Credit</td><td>0</td><td>Aesthetic Education Credit</td><td>0</td></tr>
<tr><td>Credit Hours Per Week</td><td>2 (one credit hour is 45 minutes)</td><td>Education on The Hard-Working Spirit Credit Hours</td><td>0</td><td>Language of Instruction</td><td>English</td><td>Honors Course</td><td>□Yes
☑No</td></tr>
<tr><td>Course Type</td><td colspan="3">□Core General Education Course
□Specific General Education Course
□Basic Course in General Discipline
☑Others</td><td colspan="4">2+X Major ：
□Professional Core Course
□Professional Advanced Course
Non 2+X Major ：
□Professional Compulsory Course
□Professional Elective Course</td></tr>
<tr><td>Course Objectives</td><td colspan="7">By the end of the course, students should be able to:
1. Construct a simple differential equation from a description of change.
2. Solve elementary separable and first-order linear initial-value problems.
3. Identify equilibria and describe long-term behavior.
4. Approximate solutions using Euler’s method and a spreadsheet.
5. Solve simple homogeneous second-order equations with distinct real characteristic roots.</td></tr>
<tr><td>Course Description</td><td colspan="7">This course introduces ordinary differential equations through simple models. Students learn basic solution methods, interpret solutions and graphs, and use elementary numerical approximation. The course emphasizes a small number of methods, straightforward calculations, and repeated guided practice.</td></tr>
<tr><td colspan="8">Course Requirements:
Students are expected to have a basic knowledge of calculus and elementary linear algebra. They should attend lectures regularly, complete assigned exercises, and participate in problem-solving activities.</td></tr>
<tr><td colspan="8">Teaching Methods:
Teaching will combine lectures, worked examples, classroom discussion, and problem-solving exercises.</td></tr>
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Course Director's Academic Background:

Xi Chen is currently an associate professor with tenure at the Shanghai Center for Mathematical Sciences, Fudan University. Research interests include analysis of partial differential equations, inverse problems in mathematical physics, computational wave propagation.

Instructor's Academic Background:

Members of Teaching Team

Name	Gender	Professional Title	Department	Responsibility

Topics

1 Review of essential algebra and calculus

2 Introduction to differential equations, initial-value problems, and simple models

3 Separable equations and applications

4 First-order linear equations and guided practice

5 First-order equations: further practice and review

6 Midterm exam

7 Simple applications in economics, business, and engineering

8 Qualitative behaviors of solutions and simple nonlinear models

9 Numerical approximation and computational practice

10 Elementary second-order linear equations

11 Further applications, guided practice, and general review

12 Final exam

The design of class discussion or exercise, practice, experience and so on:

Class activities will include guided problem-solving, short discussions of modeling examples, and in-class exercises.

If you need a TA, please indicate the assignment of assistant:

A teaching assistant is needed to assist with grading assignments and providing feedback to students throughout the course.

Grading & Evaluation:

Student performance will be evaluated through homework assignments (20%), in-class exercises (20%), a midterm examination, and a closed-book final examination (60%).

Usage of Textbook： □Yes (complete textbook information form below) ■No

Textbook Information (No more than two textbooks) **:**

Title	Author	ISBN	Publishing Time	Publisher	Type I	Type II

Teaching References:

Dennis G. Zill, A First Course in Differential Equations with Modeling Applications, 12th ed.