MATH 0290: Differential Equations

Spring, 2024-2025

INSTRUCTOR: Peng ZENG

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OFFICE HOURS: Tue. 09:30-12:30, Thu. 12:30-16:30

LECTURES:
Section 1 13:50-16:25 Mon. Room S105, SCUPI Building, Jiang'an South Campus
Section 2 13:50-16:25 Tue. Room S105, SCUPI Building, Jiang'an South Campus

TEXTBOOK: Differential Equations with Boundary Value Problems, 2nd Edition, Pearson, by John Polking, Al Boggess, and David Arnold.

BLACKBOARD: Please regularly log on and check https://learn.scupi.cn/.
Lecture notes, online quizzes, assignments, projects, announcements, and your grades will be uploaded on the Math 0290 page of the Blackboard.

TEACHING ASSISTANT: Guanru LI & Chaojia YU

PREREQUISITE: Math 0240 Analytic Geometry and Calculus 3

DESCRIPTION:
Differential equations (DEs) are one important mathematical description method which has been successfully applied to many fields including fundamental physics, engineering, chemistry, biology and finance even sociology. This course will conduct a comprehensive introduction to most aspects of DEs, including solutions to different types of DEs, examples of mathematical modeling problems using DEs, practical tools in dealing with DE transforms and solutions such as Laplace and Fourier transforms. Computer-aided DE tools (such as MATLAB®) will also be briefly introduced throughout this course. You will find some ideas in solving practical problems using calculus and algebra you have learned, as well as ways describing the real world more quantitatively and rigorously at the completion of this course.

COURSE OBJECTIVES:

1) Be skillful with classify and transform differential equations.
2) Be able to solve linear low-order differential equations with various techniques.
3) Understand the Laplace and Fourier transform methods to solve differential equations.
4) Know typical examples of differential equations in dealing with practical physical and engineering problems.
5) Know numerical methods in solving differential equations with computers.

GRADE DETERMINATION:

The final grade will be computed according to the following scheme:

Scheme:

Total grade = 15 % Assignments + 25 % Test 1 + 25 % Test 2 + 25 % Final Exam + 10 % Quizzes, Class Activities and Attendance. There is maximum 10% bonus added to the final grade based upon evaluation of the optional projects. The final grade will be not exceeding 100%.

Note:

All tests and final exam will be closed-book.

Conversion of numerical grades to final letter grades follows the SCUPI common grade:

A [90, 100] A- [85, 90) B+ [80, 85) B [76, 80) B- [73, 76) C+ [70, 73) C [66, 70) C- [63, 66) D+ [61, 63) D [60, 61) F (60, 0)

EXAMS:

There are two mid-tests in week 8 and week 13, respectively, and one final exam during the final exam week.

All tests and the final exam are mandatory. There will be absolutely no makeup exam for each test. If you miss the final, a makeup exam may be given for the final exam if the student has the approval from the instructor or emergencies and health issues with a valid proof. I will not accept the student deceleration for absence form for the final exam.

The makeup exam for the final exam would be run at the beginning of next semester and the grading will follow SCUPI common grade.

QUIZZES:

Quizzes will be given in tutorials. Students will be asked to complete a quiz in tutorials each week. Normally, a quiz will consist of a short question.

HOMEWORK:

All assignments are accepted only in paper form.

Each assignment should be submitted in person before the next class begins.

Students should start their homework assignments immediately after the assignments are given, and DO NOT wait until the last minute to meet the deadlines. Late assignments will be NOT accepted except for emergencies and health issues. Any other late assignments handed in will be marked but will be given 0. At most two extensions for assignments will be given in this course. All assignments will be counted in your total grade. Late submission for previous assignments during the final exam period will NOT be accepted in any form for any excuses.

ATTENDANCE:
Attendance is expected in all lectures. Valid excuses for absence will be accepted before class. In extenuating circumstances, valid excuses with proof will be accepted after class

TUTORIALS:
Tutorials run by our TA will start in Week 03.

OTHER COURSE POLICIES:
There will be no special treatments for any students in this course.

During Class: Computers may be allowed in class for the electronic recording of notes. But please refrain from using computers for any activities that are unrelated to the course. Phones are prohibited as they are rarely useful for anything in the course. Eating and drinking are allowed in class but please keep from it affecting the course.

Academic Integrity: At Sichuan University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all the work you do. Everyone at SCUPI is expected to treat others with dignity and respect. The Code of Student Conduct allows Sichuan University to take disciplinary action if students don't follow this community expectation

APPROXIMATE SCHEDULE:

The sequence of the sections covered in this class is:

Week	Contents	Descriptions
1 (02/24)	1.1 – 1.3	Introduction to differential equations.
2 (03/03)	2.1 – 2.2	Introduction to Geometric Meanings of DEs. Solutions to separable equations.
3 (03/10)	2.3 – 2.4	Scaling variables and linear equations. Models of motion.
4 (03/17)	2.5 – 2.6	Mixing problems and exact differential equations.
5 (03/24)	2.7 – 2.8	Existence and uniqueness of solutions. Initial conditions.
6 (03/31)	2.9, 3.1 – 3.2	Autonomous equations and stability. Modeling and applications.
7 (04/07)	3.4, 4.1 – 4.4	Electrical circuits. Linear homogeneous equations with constant coefficients. Harmonic motion.
8 (04/14)		Exam 1
9 (04/21)	4.5 – 4.7	Inhomogeneous equations. Forced harmonic motion.
10 (04/28)	5.1 – 5.2	The Laplace transform I.
11 (05/05)	5.2 – 5.3	The Laplace transform II.
12 (05/12)	5.4 – 5.5	The Laplace transform III.
13 (05/19)		Exam 2
14 (05/26)	5.6 – 5.7	Convolutions and examples in systems.
15 (06/02)	12.1 – 12.2	Fourier series.
16 (06/09)	12.3	Fourier cosine and sine series.
17 (06/16)	13.1 – 13.2	Eigenvalue and Sturm-Liouville problem. Heat equation. (Optional)
18 (06/23)		Final Exam Week