MATH2351 Introduction to Differential Equations
Course Outline - Spring 2025-26

MATH2351 (L1): Monday: 15:00-16:20, Friday: 10:30-11:50 room 2407 (lifts 17-18)

Course Home Page

1) https://machiang.wixsite.com/machiang, 2) http://www.math.ust.hk/people/faculty/profile/machiang/

Instructor

Professor Edmund Chiang

Email: machiang@ust.hk Office: Rm 3457

Phone: 2358-7441 Office Hours: Office hours TBA,

TA and Tutorials

Mr. ZHANG, Jiawang

Office: Rm. TBA

Email: jzhangiw@connect.ust.hk

T1A: Mon.09:30-10:20, Rm 1409(Lifts 25-26)

Mr. XI, Xiaozhe

Office: Rm. TBA

Email: xxiab@connect.ust.hk

T1B: Thu.13:30-14:20, Rm 4579 (Lifts 27-28)

Course Description

First order equations and applications, second order equations, Laplace transform method, series solutions, system of linear equations, nonlinear equations and linear stability analysis, numerical methods, introduction to partial differentiation and partial differential equations, separation of variables, and Fourier series, boundary value problems, eigenvalues and eigenfunctions, Sturm-Liouville theory, partial differential equations and Fourier series.

Duration: One semester

Credits: 3 units

Prerequisites: A passing grade in AL Pure Mathematics / AL Applied Mathematics; OR MATH 1014 OR MATH 1020 OR MATH 1024

Exclusion: MATH 2350, MATH 2352, PHYS 2124

Intended Learning Outcomes On successful completion of this course, students are expected to be able to:

No	ILOs
1	Develop an understanding of the core ideas and concepts of Ordinary Differential Equations.
2	Be able to apply rigorous and analytic approach to analyze and solve Differential Equations, including solution methods and proofs of theorems.
3	Be able to recognize the power of abstraction and generalization, and to carry out investigative mathematical work with independent judgment.
4	Be able to communicate problem solutions using correct mathematical terminology and proper English.

Assessment Scheme

This course will be assessed using criterion-referencing and grades will not be decided basing on "a curve". Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessment	Assessing Course ILOs
Homework (WeBWork) 0%	1, 2, 3
Tutorial 15%	1, 2, 3, 4
Midterm Exam 25%	1, 2, 3
Final Exam 60%	1, 2, 3

Grade	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking. Exhibits a high capacity for scholarship and collaboration, going beyond core requirements to achieve learning goals.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
D	Marginal Pass	Has threshold knowledge of core subject matter, has potential to achieve key professional skills, and the ability to make basic judgments.
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for development in the discipline

- AI policy: Although you are allowed to use AI to assist your learning and homework, you must state the where you have used AI to help your to complete the work.
- The WebWork exercises will NOT be counted toward your final grades. Students are allowed to submit and check answers through the WeBWorK. You should contact your tutors for help on problems encountered.
- Students should visit the following WeBWorK@UST page to get familiar with the system as early as possible: https://webwork.math.ust.hk/. See also
  - https://openwebwork.org/i-am-a-student/

- The midterm examination is scheduled on 27th (Thu.) March 2025 during lecture.

Learning Resources

- Boyce and Diprima *Elementary Differential Equations and Boundary Value Problems*, 10th (or earlier/latter) edition. Brooks/Cole. (main reference)
- M. Tenenbaum & H. Pollard Ordinary Differential Equations: an elementary textbook for students of mathematics, engineering, and the sciences, Dover, 1985

Teaching and Learning Activities

- Lectures, Tutorials, WeBWork

Academic Integrity

- Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Tentative course schedule

Week	Topics
1	Introduction (1.1-1.2), Integration factors, Separation of variables (2.1, 2.2)
2	Modeling (2.3), Autonomous Eqn (2.5), Exact Eqn (2.6)
3	Euler's method (2.7), Existence/Uniqueness (2.8), 2nd order homogeneous ODEs (3.1-.3.3),
4	Complex roots (3.4), non-homogeneous Eqn. (3.5), variation of parameters (3.6),
5	Applications (3.7-3.8) Eqn with ordinary point, Power series solutions (5.1-5.2)
6	ODEs with Regular singularities, Euler's Eqn (5.4), Power series solutions (5.5-5.6)
7	Laplace transforms and applications (6.1-6.2) , step functions (6.3)
8	Systems of ODEs (7.3), Homogeneous systems (7.4-7.5) **Mid-semester Exam: 23rd (Mon.) March 2026 (tentative)**
9	Complex eigenvalues (7.6), Repeated eigenvalues (7.8), Nonhomogeneous systems (7.9)
10	Boundary value problems (10.1), Fourier series (10.2-10.4)
11	Fourier series (10.2-10.4), Separation of variables (10.5), Heat Eqn (10.5)
12	Other heat conduction Eqns (10.6), Wave Eqn (10.7)
12	Wave Eqn (10.7), Laplace Eqn (10.8)
13	Sturm-Liouville theory (11.1), Revision