Math2351: Introduction to Differential Equations

Course outline - Fall 2024-2025

Instructor

Mo Mu

Contact Details: e-mail: mamu@ust.hk, Office: Room 3445

Office Hour: Thur 2:00-3:00 pm

Meeting Time and Venue

TT 3:00 - 4:20pm, Room2404

Teaching Assistants

Huang, Chutian/chuangat@connect.ust.hk, tutorial starting from Week2

Hu, Tiankai/thuah@connect.ust.hk, tutorial starting from Week2

Course Description

Credits: 3 units;

Topic: Differential equations

Exclusions: MATH 2350, MATH 2352

Prerequisites: AL Pure Mathematics/AL Applied Mathematics; or MATH 1014; or MATH 1018; or MATH 1020; or MATH 1024

Assessment Scheme

Homework: 10%; ***Midterm Exam****:* 30 %; ***Final Exam****:* 60 %

Exams:

1. ***Midterm exam:*****Topics to be covered up to Section 3.5 as in the list of topics.**

Oct 24, Week 8, in class, 3:00-4:20, Room 2404

If you *miss the midterm* due to a valid (e.g. hospitalization) and well proven reason (original documents must be submitted for verification), the only alternative is to move the midterm mark to the final.

2. ***Final exam:*120 minutes.** All materials taught in the whole semester will be tested, including those already tested in the midterm exam. But focus will be on those topics not covered in the midterm exam. The Laplace Transform Table 6.2.1 on Page 319 will be provided.
3. **Closed-book, No calculators are allowed in all exams.**

This course will be assessed using criterion-referencing, and grades will not be assigned using a curve (nor a surface), based on the University Grading Guidelines, for details, refer to https://registry.hkust.edu.hk/files/2021-05/GuidelinesOnGrading.pdf

Letter Grades: Students should aim at getting a course total of 90% or above for A-/A/A+, and about 75% or above for B-/B/B+.

Grade Descriptors:

Grades	Description	Elaboration on subject grading description
A	Excellent Performance	The student has mastered almost all concepts and techniques taught in the course, has excellent understanding of the deepest content of the subject.
B	Good Performance	The student has mastered most computational techniques taught in the course, yet the understanding of some challenging concepts may not be deep enough for further studies on related advanced subjects.
C	Satisfactory Performance	The student meets the minimum expectation of the instructor, has acquired some basic computational techniques of the subject, yet some concepts were not clearly understood.
D	Marginal Pass	The student is only able to recall some fragments of topics and is able to complete some of the easiest computations.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to complete some of the easiest computations.

Student Learning Resources

Textbooks:

Boyce and DiPrima, Elementary Differential Equations and Boundary Value Problems, 12th Ed., Global Ed., Wiley

References:

Math Support Center

Course Topics:

- **Introduction** (Chapter 1)
  - Mathematical models; Direction Fields (1.1)
  - Solution of Some DEs (1.2)
- **First Order Equations** (Chapter 2)
  - Linear equations; Method of Integrating Factors (2.1)
  - Separable equations (2.2)
- **Second Order Linear Equations** (Chapter 3)
  - Homogeneous Equations with constant coef. (3.1, 3.3, and 3.4)
  - Solutions of linear homogeneous equations, the Wronskian (3.2)
  - Non-homogeneous equations: undetermined coef. (3.5)
- **Series Solutions of Second Order Linear Equations** (Chapter 5)
  - Power series (5.1)
  - Series solutions near an ordinary point (5.2)
  - Euler Equations; Regular Singular Points (5.4)
- **Laplace Transform** (Chapter 6)
  - Laplace transform (6.1)
  - Initial value problems (6.2)
  - Step functions (6.3, 6.4)
  - Impulse functions (6.5)
- **Systems of First Order Linear Equations** (Chapter 7)
  - Introduction (7.1)
  - Basic theory (7.4)
  - Homogeneous linear systems with constant coefficients (7.5, 7.6)

Teaching Approach

Lectures: focus on illustrating the concepts of the course content.

Tutorials: focus on examples and problem solving skills.

Intended Learning Outcomes

Upon successful completion of this course, students should know the following:

1. How to model and solve simple problems using first order odes;
2. How to solve linear, constant coefficient second-order odes;
3. How to use the Laplace transform method;
4. How to construct series solutions;
5. How to solve a system of linear, constant coefficient, first-order odes.

In addition, students should

1. Demonstrate skills in reading, interpreting and communicating mathematical content which are integrated into other disciplines or appear in everyday life;
2. Develop the mathematical maturity to undertake higher level studies in mathematically related fields.

Assessing Course ILOs:

Assignments and exams: 1, 2, 3, 4, 5

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.