MATH2352 Differential Equations
Course Outline- Spring 2023-2024

1. Instructor(s)

Name:　　　　Lixin Wu

Contact Details: 2358-7435/malwu

2. Teaching Assistant(s)

Name:　　　　YAN, Ningyu/nyanac

　　　　　　　WANG, Kaibo/kwangbi

3. Meeting Time and Venue

Lectures:

Date/Time:　　Mon, Wed, 10:30am - 11:50am

Venue:　　　Classroom 1104

Tutorials:

Date/Time/Venue:　T1A Wed 15:00 - 15:50 CYTG009A

　　　　　　　　　T1B Tues 1230 – 1320 LSK 1032

4. Course Description

Credit Points:　　4

Pre-requisite:　　MATH 2111 or MATH 2121 or MATH 2131

Exclusion:　　　MATH 2350, MATH 2351

Brief Information/synopsis:

First and second order differential equations, initial value problems, numerical methods, boundary value problems, eigenvalues and eigenfunctions, Sturm-Liouville theory.

5. Intended Learning Outcomes

Upon successful completion of this course, students should 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 good English.

6. Assessment Scheme
  a. Examination duration: midterm exam, 1.5 hours; final exam, 3hours
  b. Percentage of coursework, examination, etc.:

Assessment	Assessing Course ILOs
20% by coursework	1, 2, 3
30% discussion report & participation	4
50% by exam	1, 2, 3, 4

c. The grading is assigned based on students' performance in assessment tasks/activities.

7. Student Learning Resources

Text(s):

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

Recommended Reading:

Morris Tenenbaum and Harry Pollard (1985). Ordinary Differential Equations (Dover Books on Mathematics)

Paul Blanchard and Robert L. Devaney (2011). Differential Equations (with DE Tools Printed Access Card)

Richard Bronson and Gabriel Costa (2014). Schaum's Outline of Differential Equations, 4th Edition (Schaum's Outline Series)Dennis G. Zill and Warren S Wright (2012). Differential Equations with Boundary-Value Problems (Textbooks Available with Cengage Youbook)

8. Teaching and Learning Activities

Scheduled activities: 4 hrs (lecture + tutorial)

9. Course Schedule

Keyword Syllabus:

- Introduction (Chapter 1)

  Direction fields (1.1)

  Solution to some ODEs (1.2)

  Classification of Des (1.3)

- First Order Equations (Chapter 2)

  Linear equations; Method of Integrating Factors (2.1)

  Separable equations (2.2)

  Differences between linear and nonlinear equations (2.4)

  Exact equations and integrating factors (2.6)

- 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)

  Nonhomogeneous equations; undetermined coef. (3.5)

  Variation of parameters (3.6)

- 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, 7.7)

Nonhomogeneous linear systems (7.9)

- Numerical Methods (Chapter 8)
    The Euler method
    Runge-Kutta method
    Errors and stability
- Partial Differential Equations and Fourier Series (Chapter 10)
    Two-point boundary value problems (10.1)
    Fourier series (10.2, 10.3)
    Separation of variables: heat conduction in a rod (10.5)
    Other heat conduction problems (10.6)
    The wave equation: vibration of an elastic string (10.7)