Math 2351 Introduction to Differential Equations

Syllabus – Fall 2015

Instructor

Prof. J. R. Chasnov
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Office hours: by appointment

Lectures

Mon 3:00pm-4:20pm, Fri 10:30am-12noon

Teaching Assistants and Tutorials

T1a: Mon 18:00-18:50 4579 (Liu, Gaocheng/gliuau)
T1b: Wed 19:30-10:20 CYtG009B(Liu, Hongyu/hliudv)

Course Description

Credits: 3; Topic: Introduction to differential equations
Exclusions: MATH 2350, MATH 2352, PHYS 2124
Prerequisite: MATH 1014/1020/1024

Assessment Scheme

Worksheets: 10%; Midterm: 30%; Final: 60%
See the pdf file named Grading for how final grades will be calculated.

Student Learning Resources

Course Lecture Notes can be obtained as a pdf file:
https://www.math.hkust.edu.hk/~machas/differential-equations.pdf
Textbook (for reference): Elementary Differential Equations and Boundary Value Problems by Boyce & DiPrima.

Intended Learning Outcomes

Upon successful completion of this course, students should

1. Develop an understanding of the core ideas and concepts of differential equations;
2. Recognize the power of abstraction and generalization, carry out mathematical work with independent judgement;
3. Apply rigorous, analytical and numeric approach to analyze and solve problems using concepts of differential equations;
4. Demonstrate skills in reading, interpreting and communicating mathematical content which are integrated into other disciplines or appear in everyday life;
5. Develop the mathematical maturity to undertake higher level studies in mathematically related fields.

Assessment Scheme	**Assessing Course ILOs**
Worksheets: 10%	1, 2, 3, 4, 5
Midterm: 30%	1, 2, 3, 4, 5
Final: 60%	1, 2, 3, 4, 5

Math 2351 – Fall 2025

Week 1:
0.13, 1.1, 2.1, 2.2, 2.3 Course introduction; Complex numbers, Introduction to odes, Euler Method, Separable equations, Linear equations
Week 2:
2.4, 3.1 Applications, Euler Method
Week 3:
3.2, 3.3, 3.4, 3.5 Principle of superposition, Wronskian, Homogeneous odes, Inhomogeneous odes
Week 4:
3.5, 3.7, 3.8, 4.1 Particular solutions, Resonance, Damped resonance, Introduction to Laplace transforms
Week 5:
4.2, 4.3, 4.4, 5.1 The Laplace transform, Initial value problems, Heaviside step functions, Dirac delta functions, Series solutions
Week 6
5.1, 5.2, 6.2 Series solutions, Euler equations, Systems of equations
Week 7
6.2, 6.3 Systems equations, Normal modes
Week 8
Midterm, make-up classes
Week 9
7.1 Fixed points and stability, Nonlinear pendulum
Week 10
7.2, 7.3 Bifurcation theory
Week 11
8.1, 8.3, 8.4 Derivation of the diffusion equation, Fourier series
Week 12
8.5 Solution of the diffusion equation, make-up tutorial
Week 13
8.6, 8.7 Solution of the wave equation and the Laplace equation, Final exam review