UBC Math 257/316: Elementary Differential Equations II
July-August 2016

INTRODUCTION
This course contains two parts as below:

- Math 257 Partial Differential Equations

- Math 316 Elementary Differential Equations II

You are assumed to have the knowledge of calculus, linear algebra and Elementary Differential Equations I.

INSTRUCTOR: Dr. Liangming Shen

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TEXTBOOKS

- Required text: William F. Trench, Elementary Differential Equations with Boundary Value Problems, 2013. Book 9 in the collection Books and Monographs available free online at
  http://digitalcommons.trinity.edu/mono/9.

- Recommended Reading:

  - W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, any edition since about 5th. New York: John Wiley-Sons, 1997.
  - R. V. Churchill and J. W. Brown, Fourier Series and Boundary Value Problems. New York: McGraw-Hill, 1993.
  - Iain G. Main, Vibrations and Waves in Physics, third edition. Cambridge University Press, 1993.

TIME ARRANGEMENT

- Meeting: 14:00-16:00 Tuesday/Thursday/Friday 14:00-15:00 Wednesday July 5–August 12. @MATH 100

- Office hour: 15:00-16:30 Wednesday 16:00-17:30 Friday @LSK 300B or by email appointments.

- Homework Due: 14:00 Tuesday (HW will be put on the course webpage or my personal webpage, and the solutions will appear later that week)

- Midterm Exam: 15:00-16:00 Friday, July 29. In class.

- Final Exam: August 15-20 official exam period

COURSE OUTLINE

- Week 1: Linear Ordinary Differential Equations

    - Constant Coefficient Homogeneous Linear Equations
    - Non-constant Coefficient Homogeneous Linear Equations
    - Undetermined Coefficients, Order Reduction
    - Parameter Variation

- Week 2: Linear System, Power Series Solutions I

    - Linear System
    - Review of Power Series
    - Power Series Solutions Near an Ordinary Point
    - Regular Singular Points Euler Equations

- Week 3: Power Series Solutions II, Eigenvalue Problems

    - Frobenius Methods
    - Basic Eigenvalue Problems
    - Fourier Series Solutions
    - More General Eigenvalue Problems

- Week 4: Boundary Value Problems

    - Eigenvalue Series Solutions
    - More General Boundary Value Problems
    - Sturm-Liouville Problems

- Week 5: Heat Equations and Laplacian Equations

    - Basic Heat Equations
    - Long-run Behavior and Splitting Method
    - Basic Laplacian Equations
    - General Properties and Problems in Polar Coordinates

- Week 6: Wave Equations

    - Basic Wave Equations
    - Some Special Solutions
    - More Comprehensive Examples

EVALUATION

- Homework: 10%

- Midterm: 40%

- Final: 50%

POLICIES

- Students may use no resources except for writing equipment on midterm and final examinations. This means no formula sheet and no calculator.

- There is no supplemental examination in this course. Missing a midterm normally results in a mark of 0. Exceptions may be granted in two cases: prior consent of the instructor or a medical emergency. In the latter case, the instructor must be notified within 48 hours of the missed test, and presented with a doctor's note immediately upon the student's return to UBC.