

1. **MA 30300 – Differential Equations and Partial Differential Equations for Engineering and the Sciences**
2. **Credits and contact hours:**  
3 credits  
Lecture – 2 days per week at 75 minutes for 15 weeks.
3. **Instructor's or course coordinator's name:** Shenghao Li, Guang Lin, Yanghui Liu, Alexandre Eremenko, Suchuan Dong
4. **Textbook(s):** *Elementary Differential Equations and Boundary Value Problems 10e with WebAssign Plus 1 Semester Set*, William E. Boyce, Wiley, 2014, ISBN 9781119075295
  - a. **Other supplemental materials:** None
5. **Specific course information**
  - a. **Catalog description:** This is a methods course for juniors in any branch of engineering and science, designed to follow MA 26200. Basic techniques for solving systems of linear ordinary differential equations. Series solutions for second order equations, including Bessel functions, Laplace transform, Fourier series, numerical methods, separation of variables for partial differential equations and Sturm-Liouville theory. Not open to students with credit in MA 30400. Typically offered Fall Spring Summer.
  - b. **Prerequisites or co-requisites:** MA 26200 Minimum Grade of C- or MA 27200 Minimum Grade of C- or MA 36600 Minimum Grade of C- or (MA 26500 Minimum Grade of C- and MA 26600 Minimum Grade of C-) or (MA 35000 Minimum Grade of C- and MA 36000 Minimum Grade of C-)
  - c. **Course status:**
6. **Specific goals for the course**
  - a. **Student Learning Outcomes:**
    1. Learn to solve second order linear differential equations by using power series.
    2. Learn the Laplace Transform method for solving differential equations.
    3. Learn the theory of systems of first order linear differential equations and methods for solving them.
    4. Learn numerical methods for solving differential equations.
    5. Learn about Fourier series and how to use them to solve separable partial differential equations.
  - b. **Relationship of course to program outcomes:**
7. **Topics**
  - 1 Power Series, Series solutions: near an ordinary point, near an regular singular point
  - 2 Euler equations

- 3 Bessel's equations
- 4 Laplace Transform: Solving initial value problems
- 5 Step Functions, Diff Eq with Discontinuous Forcing Functions, Impulse Function
- 6 Convolution
- 7 Systems of linear differential equations
- 8 Matrices, Fundamental matrices
- 9 Homogeneous linear systems: With constant coefficients, Complex eigenvalues, repeated eigenvalue
- 10 Nonhomogeneous linear systems
- 11 Numerical methods
- 12 Two-point boundary value problems
- 13 Fourier Series, convergence of Fourier series, Fourier series of even and odd functions
- 14 Separation of variables
- 15 Heat equation with other boundary conditions
- 16 Wave equation
- 17 Laplace equation