MATH 322 : Applied Di erential Equations II (4-0-4) 10/11/18

Catalog Description: The second in a two term sequence on the solutions of ordinary differential equations. Introduction to systems of equations, the Laplace transform and series solutions.

Course Objectives: After completing this course, students will be able to

1. Solve a matrix system of di erential equations.
2. Use Laplace transforms to solve di erential equations.
3. Solve di erential equations via power series.
4. Communicate mathematical ideas using correct and appropriate notation.

Learning Outcomes and Performance Criteria

1. Understand how to set up and solve a matrix system of di erential equations.

   Core Criteria:

   (a) Given several linear di erential equations, write an equivalent matrix system.
   (b) Transform a higher-order di erential equation into a system of rst order equations.
   (c) Use the eigenvalue method to solve a system of linear di erential equations (consider real or complex eigenvalues and repeated eigenvalues of multiplicity two).
   (d) Find critical points and classify their stability both analytically and graphically.
   (e) Solve problems from at least two applications of systems of di erential equations from the following: predator-prey, coupled oscillators, RLC-circuits, mixing problems.

   Additional Criteria:

   (a) Linearize a non-linear system.
   (b) Solve a system of initial value problems with a software package (for example ode-45

3. Understand how to solve differential equations via power series.

   Core Criteria:

   (a) Construct a power-series solution to a polynomial-coefficient, second-order differential equation.

   (b) Use the method of Frobenius to solve a second order differential equation with a regular singular point.

   (c) Generate solutions of the first and second kind to the Bessel equation.