NORTHWESTERN CONNECTICUT COMMUNITY COLLEGE

COURSE SYLLABUS

Course Title: Differential Equations **Course #: MAT* 286**

An introductory course in differential equations. Solution methods for differential equations including select first order equations, n-th order equations, and systems of linear equations using matrix techniques, Laplace transforms, and numerical methods. Series techniques for selected differential equations including Bessel's equation will be considered. Computer software and/or graphing calculators will be integrated as appropriate throughout the course. This class is recommended for science and engineering students.

Prerequisite: C or better in MAT 268 or permission by instructor.

Goals: It is the goals of the course to:

1. Solve linear first-order differential equations.
2. Solve linear second-order differential equations.
3. Solve first-order and second-order differential equations using series.
4. Solve initial-value problems using the Laplace Transform.
5. Solve application problems that can be modeled with a differential equation.

Outcomes: At the end of the course, a student should be able to:

1. Draw direction fields.
2. Use Euler's approximation method to numerically solve first-order differential equations.
3. Solve the following type of first-order differential equations using analytic techniques: separable, linear, and exact.
4. Design and solve application problems involving heating and cooling, Newtonian mechanics, and electrical circuits.
5. Determine the general solution to a homogeneous linear differential equation.
6. Solve auxiliary equations with complex roots.
7. Use the Method of Undetermined Coefficients to solve a non-homogeneous differential equation.
8. Solve second-order differential equations using variation of parameters.
9. Describe free and forced mechanical vibrations using a second-order differential equation.
10. Determine the general solution to a second-order differential equation about an ordinary point.
11. Determine the general solution to a second-order differential equation about a singular point.
12. Determine the Laplace transform of a function.
13. Determine conditions for the existence of the Laplace transform of a function.
14. Use the properties of the Laplace transform to derive new transforms.
15. Determine the inverse Laplace transform of a function including the use of the method of partial fractions.
16. Solve initial-value problems using the Laplace transform of a function.

17. Solve homogeneous systems of linear first-order differential equations using matrices.