# Minnesota State University Moorhead

# **MATH 366: Differential Equations**

#### A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: 0

OJT Hours/Week: \*.\*

#### Prerequisites:

This course requires the following prerequisite MATH 323 - Multi-Variable and Vector Calculus

Corequisites: None

MnTC Goals: None

Classify a differential equation. Solve a variety of ordinary differential equations and initial value problems using a variety of techniques, including finding exact solutions, numerical solutions, and power series solutions. Be able to discern qualitative information from a differential equation without finding an explicit or implicit solution. Students must meet the prerequisite or be concurrently enrolled in MATH 323.

#### B. COURSE EFFECTIVE DATES: 11/12/1996 - Present

#### C. OUTLINE OF MAJOR CONTENT AREAS

- 1. Solutions of differential equations and initial value problems
- 2. Existence and unicity of solutions
- 3. Modeling of real-life problems via differential equations
- 4. First-order equations: direction fields, autonomous differential equations, separable equations, linear equations, exact equations, solutions by substitutions
- 5. Higher-order differential equations, linear equations with constant coefficients, undetermined coefficients, variations of parameters, Cauchy-Euler equation
- 6. Linear and nonlinear models
- 7. Modeling with higher-order differential equations
- 8. Series solutions of differential equations, solutions about ordinary and singular points
- 9. Numerical methods: Euler and Range-Kutta methods
- 10. The Laplace Transform, the Dirac Delta Function

### **D. LEARNING OUTCOMES (General)**

- 1. Classify a differential equation.
- 2. Solve a variety of ordinary differential equations and initial value problems using a variety of techniques, including finding exact solutions, numerical solutions, and power series solutions.
- 3. Be able to discern qualitative information from a differential equation without finding an explicit or implicit solution.
- 4. Clearly express mathematical/logical ideas in writing.
- 5. Apply higher-order problem-solving and/or modeling strategies.
- 6. Use a symbolic and numerical computing software to solve differential equations, graph their solutions, and use numerical methods to solve real-life problems.

## E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

#### F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

## **G. SPECIAL INFORMATION**

None noted