

MINNESOTA WEST COMMUNITY & TECHNICAL COLLEGE

COURSE OUTLINE

DEPT. MATH

COURSE NUMBER: 2206

NUMBER OF CREDITS: 4

Lecture: 4 Lab: 0 OJT 0

Course Title:

Ordinary Differential Equations

Catalog Description:

Ordinary Differential Equations presents the theory, computations and applications of first and second order ordinary differential equations and two-dimensional systems.

Prerequisites or Necessary Entry Skills/Knowledge:

MATH 1122

FULFILLS MN TRANSFER CURRICULUM AREA(S) (*Leave blank if not applicable*)

☒ Goal 4: Mathematics/Logical Reasoning: By meeting the following competencies:

*Goal Area 4 has been met by the pre-requisite course of MATH 1121

Topics to be Covered (General)

First Order Differential Equations

- Differential Equations and Mathematical Models
- Integrals and general and particular solutions
- Slope Fields and Solution Curves
- Separable Equations and Applications
- Linear First-Order Equations
- Substitution Methods and Exact Equations
- Existence and Uniqueness Theorem

Mathematical Models and Numerical Methods

- Population Models
- Equilibrium Solutions and Stability
- Acceleration-Velocity Models
- Euler's Method
- Runge-Kutta Method

Linear Equations of Higher Order

- Second Order Linear Equations
- General Solutions of Linear Equations
- Homogeneous Equations with Constant Coefficients
- Mechanical Vibrations
- Nonhomogeneous Equations and Undetermined Coefficients
- Endpoint Problems and Eigenvalues
- Applications in Forced Oscillations and/or Electrical Circuits

Systems of Differential Equations

- First-Order systems and Applications

<ul style="list-style-type: none"> • Method of Elimination • Numerical Methods for Systems
Linear Systems of Differential Equations <ul style="list-style-type: none"> • Matrices and Linear Systems • Eigenvalue Method for Homogeneous Systems • Set of Solution Curves for Linear Systems
Nonlinear Systems and Applications <ul style="list-style-type: none"> • Stability and Phase Planes • Predator – Prey Application • Nonlinear Mechanical Systems • Chaos in Dynamical Systems
Laplace Transform Methods <ul style="list-style-type: none"> • Laplace Transforms and Inverse Transforms • Transformation and Initial/Boundary Value Problems • Translation and Partial Fractions

Student Learning Outcomes

Recognize and work with first and second-orders linear and nonlinear DE.
Model real-life situations using first-order differential equations.
Find numerical solutions of ordinary Differential Equations including Euler's Method.
Recognize and work with higher-order differential Equations.
Model real-life situations using higher-order differential equations.
Solve problems using the Laplace Transform.
Apply series solutions of linear differential equations.
Express a dynamical system as a mathematical model.
Use direction fields to illustrate solutions of differential equations.
Solve systems of differential equations.
Apply Existence and Uniqueness Theorem.
Solve boundary/initial value problems.

Is this course part of a transfer pathway: Yes ☒ No ☐

*If yes, please list the competencies below

Differential Equations (if applicable - one of three options)	MATH 2206: Ordinary Differential Equations
1. Recognize and work with first and second-orders linear and nonlinear DE.	1
2. Model real-life situations using first-order differential equations.	2
3. Find numerical solutions of ordinary Differential Equations including Euler's Method.	3
4. Recognize and work with higher-order differential Equations.	4
5. Model real-life situations using higher-order differential equations.	5
6. Solve problems using the Laplace Transform.	6
7. Apply series solutions of linear differential equations.	7
8. Express a dynamical system as a mathematical model.	8
9. Use direction fields to illustrate solutions of differential equations.	9
10. Solve systems of differential equations.	10
11. Apply Existence and Uniqueness Theorem.	11
12. Solve boundary/initial value problems.	12

Revised Date: 1/11/2024