Miami Dade College

Course Description

MAP2302 |Introduction Differential Equations | 3.00 credits

This course emphasizes ordinary differential equations, methods of solution of first-order linear and nonlinear equations and applications; homogeneous and non-homogeneous linear equations with constant coefficients, differential operator methods, higher order linear equations; the Laplace transform and its properties, elementary existence theorems, series solutions, numerical solutions of first-order equations, initial and boundary value problems, vibrations and waves, and an introduction to autonomous systems. Computational course.

Course Competencies:

Competency 1: The student will identify and classify ordinary differential equations by:

1. Identifying order
2. Identifying the differential equation as separable, exact, linear, homogeneous, or Bernoulli

Competency 2: The student will establish the analogies and differences between solutions of differential equations by:

1. Identifying the solution as a solution of an ODE, particular solution, general solution, or N-Parameter family of solutions

Competency 3: The student will demonstrate knowledge of applications of differential equations by:

1. Solving population problems
2. Solving mixture problems
3. Solving harmonic oscillator (free undamped, free damped, and forced motion) problems
4. Solving other dynamics and comportment problems

Competency 4: The student will demonstrate knowledge of the initial value problem (IVP) and boundary value problems (BVP) by:

1. Recognizing initial value problems
2. Recognizing boundary value problems
3. Applying the Existence and Uniqueness Theorem for first-order IVP
4. Applying the Existence and Uniqueness Theorem for an n-the order IVP for linear equations
5. Recognizing that the Existence and Uniqueness Theorem does not apply to BVP

Competency 5: The student will demonstrate proficiency-obtaining solutions of ODE by:

1. Solving first-order ODE of various types (separable, exact, linear, homogeneous, and Bernoulli)
2. Solving second-order ODE by applying the reduction of order method
3. Solving higher-order linear ODE with constant coefficients by applying the annihilator approach and variation of parameters
4. Solving second-order ODE with polynomial coefficients by applying series solutions

Competency 6: The student will demonstrate knowledge of the Laplace Transform method by:

1. Solving IVP for linear ODE with constant coefficients
2. Computing transforms and inverse transforms
3. Using the Shifting Theorem to compute transforms
4. Solving initial value problems with constant coefficients
5. Computing transforms of unit step and periodic functions

Competency 7: The student will demonstrate knowledge of linear systems by:

6. Determining the critical points of a system
7. Solving linear systems by substitution
8. Converting higher-order equations to systems of first-order equations

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information