## Proposed IAI Code MTH 911

# **MATH 210-DA**

## **City Colleges of Chicago**

# Course Title: Differential Equations (IAI Code: MTH 911)

Length of course:	16 Weeks
Contact Hours:	3 Contact Hours
Credit Hours:	3 Credit Hours
Lecture Hours:	3 Lecture Hours
Lab Hours:	
Weekly Plan:	3 Hours
Catalogue Description:	

A first course in ordinary differential equations. Solutions of first order and first degree differential equations, linear differential equations with constant coefficients, linear differential equations of higher order, special differential equations of second order; numerical methods, series solutions and applications included. Writing assignments, as appropriate to the discipline, are part of the course.

## Students the Course is Expected to Serve:

Engineering, physics, mathematics, and science majors, or any one interested in learning about differential equations.

## **Pre-requisites:**

Placement Test -- or Prerequisite -- MATH 208 with a minimum grade of 'C' or consent of Department Chair

## **Course Objectives:**

- 1. Solve first order differential equations and interpret solutions of differential equations
- 2. Apply the knowledge of first order differential equations on real world application problems.
- 3. Solve second order constant coefficients differential equations.
- 4. Develop the basic Laplace Transform and Series solution techniques to solve differential equations.

## **Student Learning Outcomes:**

Upon satisfactory completion of the course, students will be able to:

- A. Solve first order differential equations by Separation of Variables Method
  - Solve first order differential equations by Linear Method
  - Solve first order differential equations by Exact Method
  - Solve first order differential equations by Homogeneous Method
  - Solve first order differential equations by Bernoulli's Method

• Solve application problems using the knowledge of first order differential equations.

• Find the second solution of a second order differential equations using Reduction of Order Method

• Solve non homogeneous, higher order, constant coefficients, linear differential equations using the Undetermined Coefficients Method.

- Solve non homogeneous, higher order, constant coefficients, linear differential equations using the Variation of Parameters Method.
- Solve differential equations by Laplace Transform.
- Solve differential equations by Series Method.

## **Topical Outline:**

Week	Topics
1 – 3	I. Classification of Differential Equations
	II. First Order Differential Equations
	1. Families of Curves
	2. Origins of Initial- and Boundary-Value Problems
	3. Linear Equations
	4. Non-linear Equations
	a. Separable Equations
	b. Exact Equations
	c. Integrating Factors
	d. Homogeneous Equations

4 - 5	III. Second Order Linear Differential Equations
	1. Linear Independence
	2. Homogeneous Equations
	3. Non-Homogeneous Equations
	a. Undetermined Coefficients
	b. Variation of Parameters
	c. Reduction of Order
6 - 8	IV. Series Solution of Second Order Linear Differential Equations
	1. Series Solutions Near an Ordinary Point
	2. Taylor Series Solutions Near a Regular Singular Point
	3. Method of Frobenius
9 – 11	V. Higher Order Linear Differential
	Equations
	1. Homogeneous Equations with Constant Coefficients
	2. Variation of Parameters
	3. Undetermined Coefficients
	4. Reduction of Order

12 - 14	VI. The Laplace Transform
	1. Definition
	2. Properties of Laplace Transform
	3. Solution of Initial Value Problems
15 – 16	VII. Numerical Methods
	1. Euler's Method
	2. Modified Euler's Method
	3. Runge – Kutta Method
	4. Picard's Method

## Calendar:

## Methods of Evaluation:

### **Total Percentage:** 0%

The weight given to exams, quizzes, and other instruments used for evaluation will be determined by the instructor

### Methods of Assessment:

Exams, quizzes, homework and other assessments will be used as appropriate to assess student learning.

### Methods of Instruction:

Problem-based activities, collaborative-learning techniques, and lecture will be used as appropriate.

### **Recommended Text:**

1. Edwards and Penney *Elementary Differential Equations,* 4th Edition, Pearson/Prentice Hall, 2008