OFFICIAL SYLLABUS

MATH 305: DIFFERENTIAL EQUATIONS I

Adopted – Fall 2012; Committee: C. Lu, G. Pelekanos, M. Song, Y. May, K.H. Leem

Catalog Description: [Dist.NSM] First order ordinary differential equations, linear ordinary differential equations of higher order, systems of first order linear equations, applications. Prerequisite: 250 and PHYS 211a.

A. Course Description

This is an introductory course in Differential Equations. It includes a study of the theory of differential equations, solutions and initial value problems, solutions of first order differential equations (exact, linear). Mathematical models of first order differential equations. Linear second order equations with applications and higher order differential equations. Power series or Laplace Transform solutions of linear differential equations.

B. Course Objectives

To develop an understanding of skills in solving differential equations and initial value problems, to develop skills in applying differential equations to physical world.

C. Textbook

Differential Equations with Boundary-Value Problems, 8th Edition, by Dennis G. Zill and Warren S. Wright

D. Course Outline and Topics

Chapter 1. INTRODUCTION TO DIFFERENTIAL EQUATIONS.

Section 1. Definitions and Terminology (brief review).
Section 2. Initial-Value Problems(brief review).

Chapter 2. FIRST-ORDER DIFFERENTIAL EQUATIONS.

Section 1. Solution Curves Without a Solution.
Section 2. Separable Variables.
Section 3. Linear Equations.
Section 4. Exact Equations and Integrating Factors.
Section 5. Solutions by Substitutions.

Chapter 3*. MODELING WITH FIRST-ORDER DIFFERENTIAL EQUATIONS.

Section 1. Linear Models.
Section 2. Nonlinear Models.
*First-order Difference Equations (Instructor should supply notes as this topic is not covered in this textbook)

Chapter 4. HIGHER-ORDER DIFFERENTIAL EQUATIONS.

Section 1. Preliminary Theory-Linear Equations.
Section 2. Reduction of Order.
Section 3. Homogeneous Linear Equations with Constant Coefficients.
Section 4. Undetermined Coefficients-Superposition Approach.
Section 5. Undetermined Coefficients-Annihilator Approach.
Section 6. Variation of Parameters.

Chapter 5. MODELING WITH HIGHER-ORDER DIFFERENTIAL EQUATIONS.

Section 1. Linear Models: Initial-Value Problems.
Section 2. Linear Models: Boundary-Value Problems.
Section 3. Nonlinear Models [optional].

Either **Chapter 6. SERIES SOLUTIONS OF LINEAR EQUATIONS.**

Section 1. Review of Power Series Solutions About Ordinary Points.

Section 2. Solutions About Singular Points.

Or **Chapter 7. LAPLACE TRANSFORM.**

Section 1. Definition of the Laplace Transform.

Section 2. Inverse Transform and Transforms of Derivatives.

Chapter 8. SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS.

Section 1. Preliminary Theory.

Section 2. Homogeneous Linear Systems.

Chapter 3. Section 3. Modeling with Systems of First-Order Differential Equations.

Chapter 4. Section 8. Solving Systems of Linear Differential Equations by Elimination.

Chapter 10. PLANE AUTONOMOUS SYSTEMS.

Section 1. Autonomous Systems.

Section 2. Stability of Linear Systems.