

ODEs for Sci/Eng. Math 331 Syllabus

Textbook: *Advanced Engineering Mathematics* by Erwin Kreyszig, 10th Edition.
Spring 2013

Chapter 1. First Order ODEs

Section 1.1 : Basic Concepts, Modeling.

Section 1.2 : Geometric Meaning. Direction Fields. Euler's Method.

Section 1.3 : Separable ODEs. Modeling.

Section 1.5 : Linear ODEs (integrating factors). Bernoulli Eq., Population Dyn.

Section 1.4 : Exact ODEs. More on Integrating Factors.

Chapter 2. Second Order Linear ODEs

Section 2.1 : Homogeneous Linear ODEs of Second Order.

Section 2.2 : Homogeneous Linear ODEs with Constant Coefficients.

Section 2.4 : Modeling: Free Oscillations. Mass Spring System

Section 2.6 : Existence and Uniqueness of Solutions. Wronskian.

Section 2.7 : Non-homogeneous ODEs

Section 2.8 : Modeling: Forced Oscillations. Resonance

Section 2.9:(*Optional*) Solution by Variation of Parameters.

Chapter 4. Systems of ODEs. Phase Plane. Qualitative Methods

Section 4.0 : Basics of Matrices and Vectors.

Section 4.1 : Systems of ODEs as Models.

Section 4.2 : Basic Theory of Systems of ODEs

Section 4.3 : Constant coefficient systems. Phase Plane method.

Section 4.4 : Criteria for Critical Points. Stability.

Chapter 6. Laplace Transforms

Section 6.1 : Laplace Transform. Inverse transform. Linearity. s-Shifting

Section 6.2 : Transforms of Derivatives and Integrals.

Section 6.3 : Unit Step Function. t-Shifting.

Section 6.4 : Short Impulses. Dirac's Delta Function. Partial Fractions.

Section 6.8 : Laplace Transforms. general Formulas.

Section 6.9 : Table of Laplace Transforms.