MATH 225 - Linear Algebra and Differential Equations

Prof Baxendale - Fall 2013

TEXT: Differential Equations and Linear Algebra (Third Edition), by Stephen W. Goode and Scott A. Annin, published by Pearson Prentice Hall. ISBN-10: 0-13-045794-9 / ISBN-13: 978-0-13-045794-3.

CHAPTER 2 MATRICES AND SYSTEMS OF LINEAR EQUATIONS: Sections 2.1 to 2.7. Definitions and notation, matrix algebra, systems of linear equations, elementary row operations, row-echelon matrices, Gaussian elimination, inverse of a square matrix. elementary matrices. (The material in Section 2.7 is optional.) 9 lectures.

CHAPTER 3 DETERMINANTS: Section 3.4, then 3.3. Summary of properties of the determinant, cofactor expansions. 3 lectures.

CHAPTER 4 VECTOR SPACES: Sections 4.1 to 4.7. Vectors in $\mathbb{R}^n$, definition of vector space, linear subspaces, spanning sets, linear dependence and independence, bases and dimension, change of basis. 7 lectures

CHAPTER 5 LINEAR TRANSFORMATIONS: Sections 5.1 to 5.7. Linear transformations, transformations of $\mathbb{R}^2$, kernel and range, composition of transformations, the matrix of a linear transformation, eigenvalues and eigenvectors. 6 lectures.

CHAPTER 1 FIRST ORDER DIFFERENTIAL EQUATIONS: Sections 1.2 and 1.6. Basic concepts and definitions, first order linear differential equations. 2 lectures.

CHAPTER 6 LINEAR DIFFERENTIAL EQUATIONS OF ORDER n: Sections 6.1 to 6.4. General theory, homogeneous and non-homogeneous linear differential equations, the Wronskian, constant-coefficient homogeneous linear differential equations, method of undetermined coefficients, complex valued solutions. 6 lectures.

CHAPTER 7 SYSTEMS OF DIFFERENTIAL EQUATIONS: Sections 7.1 to 7.7. First order linear systems, vector formulation, general results for first order linear systems, fundamental matrix solution, solutions for constant coefficient case using eigenvalues and eigenvectors. 7 lectures.

COMMENTS

The number of lectures on each chapter is a suggestion. Some professors may spend more time on some topics and less on others. The suggested total of 40 lectures leaves some time available for midterm tests and review.

To use solutions of homogeneous Diff Eqns as examples in Chapter 4, one may wish to start with 1.2, needed only for the definitions presented. In this case one could then cover 1.6 also, or else wait until the material on linear algebra is finished.

The LU decomposition in 2.7 is not needed later. Elementary matrices can be introduced in 2.4.

Specific examples of computing determinants using cofactors appear in 3.3. Augment 3.4 with material from 3.1–3.3 as desired.

The "Rank-Nullity Theorem" in 5.3 can be omitted, and only the topic of composition from 5.4 is required.