



Shanghai University of Finance & Economics

2018 Summer Program

MAT 21 Linear Algebra and Differential Equations

Course Outline

Term: June 4 – June 29, 2018

Class Hours: 6:00-8:00PM (Monday through Friday)

Course Code: MAT 21

Instructor: Anja Bankovic

Home Institution: Boston College

Office Hours: TBA and by appointment

Email: anja289@yahoo.com

Credit: 4

Class Hours: This course will have 52 class hours, including 32 lecture hours, professor 8 office hours, 8-hour TA discussion sessions, 4-hour review sessions.

Course Description:

This is a lower division course in linear algebra and differential equations. Linear algebra is one of the fundamental tools in mathematics. The theory was first developed to study the systems of linear equations. The obtained tools ended up being useful in studying differential equations, operator theory, quantum mechanics, probability theory, combinatorics, and almost every other branch of mathematics, physics, and computer science.

Differential equations are equations involving functions and their derivatives. They appear frequently in physics, biology, and economics when complicated processes are approximated with mathematical models. We will learn how to solve first and second order differential equations, linear systems, and certain partial differential equations.

We will start with an introduction of vector spaces. Then we will introduce linear transformations, their matrices, and determinants. We will further study linear transformations and operators, their



characteristic and minimal polynomials, spectral theorems, diagonal and Jordan forms. The course will then proceed to the study of differential equations. The course will finish with the study of quadratic forms, Hermitian spaces, and Hilbert spaces.

Required Textbooks:

David C. Lay: Linear Algebra and Its Applications, 3rd edition

William E. Boyce, Richard C. DiPrima: Elementary Differential Equations and Boundary Value Problems, 7th edition

Grading & Evaluation:

Homework and quizzes: 30%

Midterm: 30%

Final: 40%

Course Schedule:

Week 1:

Session 1: Introduction. Linear independence.

Session 2: Linear transformations. Composition.

Session 3: Inverse. Determinant.

Session 4: Vector spaces.

Week 2:

Session 1: Kernels and ranges. Bases. Rank theorem.

Session 2: Matrix of a transformation. Eigenvalues and eigenvectors.

Session 3: Diagonal operators. Spectral theorem.

Session 4: Dot Product. Orthogonal decomposition.

Week 3:

Session 1: Least squares. Symmetric matrices.

Session 2: Exponential function and mass on a spring. Second order Homogenous and non-homogenous equations.

Session 3: Higher order equations. Systems of linear differential equations.

Session 4: Matrix exponential. Heat equation. Wave equation.

Week 4:

Session 1: Fourier series.

Session 2: Laplace's equation.

Session 3: Review.



上海财经大学

Shanghai University of Finance & Economics

中国上海市国定路777号 邮编200433 777 Guoding Road, Shanghai, 200433, China
