

Graduate Course: Topics in Matrices Berlin Mathematical School-Fall 2007

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1 Introduction

Theory of Matrices is a fundamental subject which bridges pure and applied mathematics. It is widely used in biology, computer science, engineering, physics and various social sciences. The aim of this course is to introduce the students to various topics in matrix theory which are basic for many theoretical and applied areas of mathematics. It will try to mention numerical aspects of the topics and the use of linear algebra packages as MATLAB or Linear Algebra package in Maple.

The formal prerequisite for this course is a basic course in linear algebra, basic concepts in algebra and basic facts from theory of one complex variable. More advanced tools in modern mathematics used for the advanced part of this course as: algebraic geometry, advanced topics in analysis, probability and several complex variables, will be explained.

2 Topics of the course

1. Domains, Modules and Matrices.
2. Canonical Forms for Similarity.
3. Functions of Matrices and Analytic Similarity.
4. Inner Product Spaces.
5. Elements of Multilinear Algebra.
6. Norms.
7. Nonnegative Matrices.
8. Graphs and Matrices.
9. Applications of Algebraic Geometry to Matrices.
10. Probability and Matrices.

(Some topics can be added or changed during the course. Requests for special topics are welcome.) At least a first half of the course would follow the draft of my book "Matrices" available on the website:

<http://www2.math.uic.edu/~friedlan/bookm.pdf>

See also other lecture notes on bottom of my webpage:

<http://www2.math.uic.edu/~friedlan/research.html>

and the "teaching part" of my webpage.