Year 2012-13

Linear Algebra and Dynamical Systems (21892)

Degree/study: ADE and Economics degrees
Course: 3rd and 4th
Term: first
Number of ECTS credits: 5 credits
Hours of student's dedication: 125
Language or languages of instruction: English
Professor: Gábor Lugosi

1. Presentation of the subject

This course is dedicated to the principles of dynamical systems. The material includes examples of growth models and their analysis via systems of differential equations. Basic notions such as equilibrium, stability, bifurcations, sources, sinks, etc. are discussed. Linear systems of differential equations are thoroughly analyzed and some aspects of nonlinear systems are discussed as well. The course also covers basic mathematical tools including principles of linear algebra, eigenvalues and eigenvectors of matrices, and complex numbers.

2. Competences to be attained

text

3. Contents

1. Examples of simple differential equations, logistic growth model, equilibrium, stability.

2. Planar systems: linear sistems of two differential equilibrium and their classification. Sources, sinks, saddle points.

3. Complex numbers. Complex eigenvalues and eigenvectors.

4. Higher-dimensional linear algebra: linear independence, quadratic matrices, determinants, eigenvalues, eigenvectors.

5. Higher-dimensional linear systems. Canonical forms.

6. The exponential function of a matrix. Autonomous and non-autonomous linear systems.

7. Non-linear systems. The variational equation and stability.

4. Assessment

5. Bibliography and teaching resources

5.1. Basic bibliography

Large part of the material of the course is based on the book Hirsch, Smale, and Devaney: "Differential equations, dynamical systems,& an introduction to chaos"

5.2. Additional bibliography

5.3. Teaching resources

Aula global

6. Methodology

text

7. Activities Planning

text