

UNIVERSITY OF CRAIOVA
Faculty of Mathematics and Computer Science
Department of mathematics
Fundamental domain : Exact sciences
Domain: Mathematics
Master : Applied mathematics
Form : Day classes
Duration of studies : 2 years
Approved with academic year 2009-2010

Dynamical systems and application in economy

Syllabus

Course coordinator: Prof. dr. Carmen Roçşoreanu

Code : MA 222

Cycle II : MASTER

Second year, Semester II, Course 28 hours, Seminar 28 hours

Number of credits : 7

Domain : Mathematics

Type : compulsory

Category: specialty

Objectives: Knowledge of the techniques for the qualitative study of nonlinear dynamical systems, knowledge of the main types of bifurcations in a parameter dependent dynamical system, detection of the parameters for which the system evolves towards stable states; knowledge and analysis of some dynamical systems which modelize economic phenomena.

Necessary background: ordinary differential equations, numerical analysis

Evaluation form: Exam (E).

Contents:

1. Dynamical systems and their topological equivalence

Dynamical systems, equilibrium points, faze trajectories, limit cycles. Topological equivalence of dynamical systems. Normal forms. Central manifold. Numerical simulation. XPPAUT

2. Bifurcations in dynamical systems

Bifurcation and diagrams of bifurcation. Codimension. Structural stability. Hopf, homoclinic, Bogdanov-Takens bifurcations. Numerical analysis of bifurcations. Soft XPPAUT and AUTO

3. Dynamical systems in economy

Business cycle models: Cobb-Douglas, Goodwin, Kaldor, Swan-Solow. Models of economical grow. Models for work productivity. Leontief, Denenbourg, de Parma and Kahn Models. Advertising Model.

Bibliography:

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3. Dumortier, F., Roussarie, R., Sotomayor, J., Zoladek, H. - *Bifurcations of planar vector fields, nilpotent singularities and abelian integrals*, Springer, Berlin, 1991.
4. Day R., *Complex economic dynamics, vol I. An introduction to dynamical systems and market mechanisms*, MIT, 1994.
5. Day R., *Complex economic dynamics, vol II. An Introduction to Macroeconomic Dynamics*, MIT, 2000.
6. Ermentrout, B. XPPAUT, <http://www.math.pitt.edu/xpp/xpp.html>.
7. Ermentrout, B. - *Simulating, analyzing and animating dynamical systems: a guide to xppaut for researches and students*, SIAM, 2002.
8. Fuente A., *Mathematical Methods and Models for Economics*, Cambridge Univ. Press, 2000.
9. Hale, J.K., Kocak, H.-*Dynamics and bifurcations*, Springer, New York, 1991.
10. Kuznetsov, Yu. - *Elements of applied bifurcation theory*, third edition, Springer, New York, 2004.

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12. Roçşoreanu, C.-*Bifurcatiile sistemelor dinamice continue. Aplicatii in economie si biologie*, Universitaria, Craiova, 2006.
13. Sterpu, M. Roçşoreanu, C. Modelarea și simularea proceselor economice, Universitaria, Craiova, 2007.
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