

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 2008-2009

Dynamical Systems Syllabus

Course coordinator: Lect.dr. Octavian G. Mustafa
Code: MA114
Second Cycle: MASTER
First Year , Semester 1, Course 28 hours, Seminar 28 hours
No. of credits: 6
Domain: Mathematics
Type : compulsory
Category: speciality

Objectives : A review of fundamental results of smooth dynamical systems theory and their application to celestial mechanics and synchronization (chaos control).

Necessary background : Linear algebra and ordinary differential equations.

Evaluation : Written test (C).

Contents:

Introduction. Plane dynamical systems. Poincaré-Bendixson theory.
Structural stability. Topological classification. Invariant manifolds. Limit-cycles. Canonical forms.
Discrete dynamical systems and synchronization. Fundamental results.
Special cases of the n -body problem. Hamiltonian methods. Asymptotic methods.

Bibliography

- C. Chicone, *Ordinary differential equations with applications*, Springer-Verlag, Berlin, 2006.
F. Dumortier, J. Llibre, J.C. Artés, *Qualitative theory of planar differential systems*, Springer-Verlag, Berlin, 2006.
L.P. Shilnikov, A.L. Shilnikov, D.V. Turaev, L.O. Chua, *Methods of qualitative theory in nonlinear dynamics*, World Scientific, Singapore, 1998.
M. Golubitsky, V. Guillemin, *Stable mappings and their singularities*, Springer-Verlag, New York, 1973.
S. Sternberg, *Celestial mechanics*, W.A. Benjamin Inc., New York, 1969.
K.R. Meyer, G.R. Hall, *Introduction to hamiltonian dynamical systems and the n -body problem*, Springer-Verlag, New York, 1992.
A. Pikovsky, M. Rosenblum, J. Kurths, *Synchronization. A universal concept in nonlinear sciences*, Cambridge Univ. Press, Cambridge, 2001.
C.W. Wu, *Synchronization in coupled chaotic circuits and systems*, World Scientific, New Jersey, 2002.
J.P. LaSalle, *The stability of dynamical systems*, SIAM Reg. Conf. Ser. Appl. Math., Philadelphia, 1976.
C. Avramescu, O.G. Mustafa, *Ecuatii diferențiale și sisteme dinamice*, Reprgr. Univ. Craiova, 1999.