INTRODUCTION TO DYNAMIC SYSTEMS

Dynamic systems are ubiquitous in all fields of science. Therefore, their analysis and mathematical modelling is of paramount importance for understanding the surrounding world. This lecture course constitutes a simple and unified introduction to the theory of dynamic systems and its applications to various scientific fields. The discussion of the theoretical concepts and methods will always be detailed, illustrated by numerous examples and kept as simple as possible in order to offer working knowledge for independent personal applications.

The main topics are the following:

-Mathematical tools, differential equations, matrices, vectors.

-Linear and non-linear equations' systems. Method of linearization.

-Hamiltonian and dissipative systems.

-Phase-line and phase-space analysis, isoclines, nullclines, force fields.

-Equilibrium points. Classification, stability, Lyapunov theorem, Routh-Hurwitz criterion, Decartes' sign rule.

-Steady state in chemical kinetics.

-Oscillating chemical reactions.

-Equilibrium and non-equilibrium thermodynamics.

-Non-linear mechanical systems in engineering.

-Sociology and psychology. Evolution of human relations.

-Biological populations. Lotka-Volterra predator-prey system; insects' outbreaks.

-Microeconomics. Business development.

-Public health and epidemic.

-Oscillating transport kinetics.

-Weather forecast. Lorentz equations, chaotical attractor, butterfly effect.

-Physiology. Heart functioning.

-Chemical engineering. Process dynamics.

-Discrete dynamical systems. Difference equations, bifurcations, chaos and fractals. Verhulst's logistic equation.

Termin	Dzień tygodnia	Godzina	Miejsce
09.04.2018	poniedziałek	09.15 – 12.00	Minicentrum Konferencyjne (Luwr)
10.04.2018	Wtorek	09.15 – 12.00	Minicentrum Konferencyjne (Luwr)
11.04.2018	Środa	09.15 – 12.00	Minicentrum Konferencyjne (Luwr)
12.04.2018	Czwartek	09.15 – 12.00	Minicentrum Konferencyjne (Luwr)
13.04.2018	Piątek	09.15 – 12.00	Minicentrum Konferencyjne (Luwr)

W terminie **16 – 20.04.2018** odbędą się egzaminy końcowe z ww przedmiotu oraz konsultacje dla doktorantów.