Dynamical Systems and Chaos (0540-6308-01) - Fall 2017/2018

Yair Shokef | http://shokef.tau.ac.il | shokef@tau.ac.il | 03-640-8393 | Wolfson 334

Course Outline:

Introduction to chaos, dynamical systems, mappings, phase space, Poincare sections, delay coordinates, fixed points, limit cycles, the logistic map, period-doubling bifurcations, linearization, stability, Frobenius-Perron equation, probability measure, Lesbegue measure, Lyapunov exponents, strange attractors, fractal dimensions, box counting-dimension, linear stability of high-dimensional flows, pointwise dimension, Lyapunov dimension, phase space contraction, classification of fixed points, correlation dimension, universality, quasiperiodicity, transition to chaos, controlling chaos, stabilizing unstable periodic orbits, targeting, synchronizing.

Recommended Books:

Edward Ott - Chaos in dynamical systems (1993, 2002) - 530.151 OTT

Steven Strogatz - Nonlinear dynamics and Chaos (1994) - 530.151 STR

K.T. Alligood, T.D. Sauer, J.A. Yorke - Chaos: an introduction to dynamical systems (1996) - 517.15 ALL

Gregory L. Baker and Jerry P. Gollub - Chaotic dynamics: an introduction (1990, 1996) - 530.151 BAK

Robert C. Hilborn - Chaos and nonlinear dynamics (1994, 2000) - 530.151 HIL

Grading:

70% Home assignments, including analytical and numerical exercises, as well as reading assignments

30% Oral presentation of a scientific paper