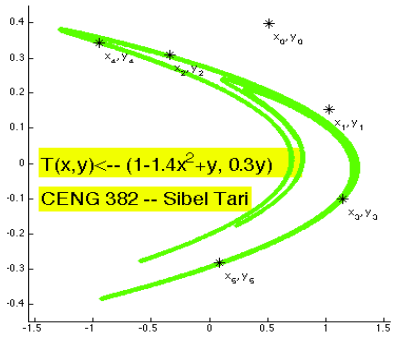
CENG 382 Analysis of Dynamic Systems
Fall 2018

Instructor **TA**	Sibel Tarı (Room: A-403) stari@metu.edu.tr Ferhat Arslan (Room: A-410) ferhat.arslan@metu.edu.tr
Schedule	Wed 08:40-09:30 and Fri 12:40-14:30 (BMB-1)
Textbook	Invitation to Dynamical Systems (E. R. Scheinerman)
Reference Books	1. Nonlinear Dynamics and Chaos (Steven Strogatz) 2. Introduction to Dynamic Systems: Theory, Models, and Applications (D. Luenberger)
Prerequisite	Notion of derivative and difference; Linear Algebra.
Grading	2 MT Exams %45; HW 30%; Final 25%



A simple map with chaotic orbit

Rules and Regulations
• The communication platform is *odtuclass*. Students should follow *odtuclass* regularly for announcements and posted material • HW reports should be prepared using word processing • HWs may require MATLAB

Outline
(2 weeks) What is a dynamical system? State vectors in discrete and continuous time. Iterated maps and flows. Examples (mass-spring, pendulum, bank account, pushing calculator buttons) What is a dynamical system? Pendulum revisited – linear approximation, numerical solution. More Examples. MATLAB
(1 week) Linear Systems in 1D: Discrete time. Continuous time.
(3 weeks) Linear Systems in multiple dimension: Discrete time. Continuous time. Positive Systems
(6 weeks) Nonlinear Systems: Linearization for multiple dimensional systems. Problems with linearization. Lyapunov functions. Case Studies. Periodicity and chaos in continuous time. One-dimensional systems. Two dimensional systems. Higher dimensions: the Lorenz system and chaos. Periodicity and chaos in discrete time. Stability of periodic points.
(2 weeks) Fractals Complex Dynamical Systems.