

# Advanced theory of dynamical systems

advanced course at the Mathematics MSc and Applied Mathematics MSc,  
elective course for Phd students in Mathematics or Physics .

2/0/0/f/2, Neptun: BMETE95MM12

**Instructor: PÉTER BÁLINT**

Spring 2021

Tuesday, 16.15-18.00, online, via Teams

Starts on February 9

This is a follow-up course on *Dynamical systems* (BMETE93MM02) OR *Ergodic theory and dynamical systems* (BMETE95AM22), yet, some topics will be revisited to keep the course self-contained. The main objective is to study chaotic dynamical systems, in particular to investigate in what sense *deterministic time evolution may lead to the emergence of stochastic phenomena*. In addition to their mathematics interest, such questions are important for a host of applications (in physics, biology, meteorology, economics etc.) Another feature of the theory of dynamical systems is a large variety of the applied tools. At the course, the classical methods of the 1960's and 1970's along with some recent breakthrough results are demonstrated on simple, yet typical examples (eg. expanding maps of the interval).

Main topics planned:

- Ergodic theorems – Birkhoff, Kingman, Oseledec;
- Mixing properties and their characterization;
- Spectral theory of one dimensional maps – Perron-Frobenius operator, Lasota-Yorke inequality;
- Probabilistic limit theorems in a dynamical context;
- One dimensional expanding maps with a neutral fixed point – coupling methods, Young tower construction.

Homepage: <http://www.math.bme.hu/~pet/ergod2>