| Program | Type of studies (cycle) | Third cycle |
|---|---|---|
| | Name of the program | Science and mathematics education |

**Course**

| Course title | **Continuous dynamic systems** |
|---|---|

| Course code | Semester | Course status | ECTS credits | Contact hours |
|---|---|---|---|---|
| AMAT 653 | II | Optional | 10 | 30 |

| Teaching staff | Teacher | |
|---|---|---|
| | Other staff | |
| Course goals | The aim of the course is to provide students with basic knowledge in dynamic systems theory and qualitative theories of differential equations. | |

Course content/topics

- Overview of the basic concepts and theorems of ordinary differential equations. Vector fields, flows, linear systems, fixed points, linearization, phase portraiture, stability. Floquet's theorem, matrix logarithm
- Poincare mapping. Examples. Duffing equation
- Equivalence, equivalence of linear systems. Hartman-Grobman theorem.
- Border rallies. Poincare- Bendixon's theorem.
- Normal forms. Resonance. Poincare's theorem.
- Central multiplicity. Approximative calculations.
- Fixed-point bifurcations. Zero inherent value. Hopf's bifurcation.
- The attractors. Lorenzov, Rosler and Chua attractors.

**LITERATURE**


[1] K.T. Alligood, T.D. Sauer, J.A. Yorke, Chaos (An Introduction to Dynamical Systems), Springer, 1996.

[2] Robert L. Devaney, An Introduction to Chaotic Dynamical Systems, 2nd edition, 2003.

[3] Saber N. Elaydi, Discrete Chaos, ChapmanHall/CRC, 2000.

[4] J. Guckenheimer, P. Holmes, Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields, Springer, 1983.

[5] M. Hirsh, S. Smale, R. Devaney, Differential equations, dynamical systems and an introduction to chaos, Elsevier, 2004.

[6] M.R.S. Kulenovic, O. Merino, Discrete Dynamical Systems and Difference Equations with Mathematica, Chapman-Hall/CRC, 2002.

[7] S. Lynch, Dynamical systems with applications using Mathematica, BirkhÄauser, 2007.

[8] C. Robinson, Dynamical Systems, CRC, 2nd edition, 1999.

[9] G. Teschl, Ordinary Differential Equations and Dynamical Systems, Springer, 2009

[10] S. Wiggins, Introduction to applied nonlinear dynamical systems and chaos, Springer, 2003.


**Grading**

| | Criterion | Points | Cut-off points |
|---|---|---|---|
| 1. | Written assignment | 25 | 13 |
| 2. | Project | 25 | 12 |
| 3 | Final exam | 50 | 30 |
| | Total | 100 | 55 |