Study programmes: Astronomy and Astrophysics - PhD studies

Course name: Dynamical Astronomy

Lecturers: Nataša Todorović

Status: optional

ECTS: 9

Attendance prerequisites: none

Course aims: An overview od dynamical process in astrophysical systems from planetary to galactic.

Course outcome: Students are able to solve problems related to stability and evolution of planetary orbits, processes of scattering, structure and dynamics of galaxies and their collisions.

Course content: Order and Chaos in General. Terminology a n d Classification. Dynamical Systems. Integrable, Chaotic, Ergodic, Mixing, Kolmogorovand Anosov Systems. Oldand New Classification.Integrable Systems. The Third Integral. KAM Theory. Nekhoroshev Theory. Periodic Orbits. Systems of Two Degrees of Freedom. Transition from Order to Chaos. The Last KAM Torus. Properties of the last KAM torus. Methods for Locating the Last KAM Torus Dynamical Spectra. Lyapunov Characteristic Numbers. Distinction Between Ordered and Chaotic Motions. Frequency Analysis. Systems of Three Degrees of Freedom. Simple Resonant 3-D Systems. Fractals. Order and Chaos in Galaxies. Orbits in 2-D Galaxies Orbits in 3-D Galaxies. Integrable and Nonintegrable Galactic Models .

Literature:

Lectures and exercises based on:

1. George Contopoulos: Order and Chaos in Dynamical Astronomy,Springer, 2002
2. Dynamical Astronomy Java Lab: http://burro.astr.cwru.edu/JavaLab/
3. Scripts of A. Kovačević

Number of hours: 10	**Lecures: 4**	**Tutorials: 6**

Teaching and learning methods: Frontal / Group / Practical

Assessment (maximal 100 points)

Course assignments	**points**	**Final exam**	**points**
Lectures	10	Written exam	
Exercises / Tutorials	30	Oral exam	60
Colloquia			
Essay / Project			