

<b>Study programmes:</b> PhD studies - Astronomy and Astrophysics				
<b>Course name:</b> Numerical Methods of Celestial Mechanics				
<b>Lecturers:</b> Bojan Novaković				
<b>Status:</b> optional				
<b>ECTS:</b> 9				
<b>Attendance prerequisites:</b> None				
<b>Course aims:</b> Introduction to modern numerical methods used to solve scientific problems in celestial mechanics.				
<b>Course outcome:</b> On completion of this course students should be able to work independently and apply the acquired knowledge for a numerical studying and modeling of the solar system, as well as to address specific problems of the long-term dynamics of our solar system and extrasolar planetary systems.				
<b>Course content:</b>				
<p><b>1. N-body problems:</b> Differential equations of motion of celestial bodies and their characteristics. Perturbations. Equations in rectangular coordinates and variations of parametric variables.</p> <p><b>2. Numerical integration of the equations of motion:</b> Taylor's series methods. Runge-Kutta methods. Everhart algorithm. Explicit and implicit multistep methods. Symplectic integrators and design of algorithms of high accuracy. <b>OrbFit</b> and <b>SWIFT</b> integrators.</p> <p><b>3. Methods for detection of chaotic motion:</b> <i>Lyapunov characteristic exponent. Fast Lyapunov indicator. Method of frequency analysis.</i> Diffusion coefficients.</p>				
<b>Literature:</b>				
<p>1. Souchay J., Dvorak R. (Eds.): <b>Dynamics of Small Solar System Bodies and Exoplanets</b>, Lect. Notes Phys. 790, Springer, Berlin Heidelberg, 2010</p> <p>2. <b>Selected articles from scientific journals</b></p> <p>3. Т. В. БорДОВИЦИНА, <b>Modern numerical methods in tasks of celestial mechanics (in russian), 1984</b></p>				
<b>Number of hours: 10</b>		<b>Lectures: 4</b>	<b>Tutorials: 6</b>	
<b>Methods of teaching:</b> Frontal, Group, <i>Individual Research</i> Approach				
<b>Assessment (maximal 100 points)</b>				
<b>Course assignments</b>		<b>points</b>	<b>Final exam</b>	<b>points</b>
Lectures		10	Written exam	-
Exercises / Tutorials		-	Oral exam	40
Colloquia		-	Written-oral exam	-
Essay / Project		50		