

Study programs: Bachelor studies – Astronomy and astrophysics				
Course name: Theoretical astronomy				
Lecturers: Bojan Novaković				
Status: Elective				
ECTS: 5				
Attendance prerequisites: Introduction to celestial mechanics				
Course aims: Acquisition of general and specific knowledge for determination of the asteroid and cometary orbits.				
Course outcome: Upon completion of the course, the student has the basic knowledge necessary to calculate the osculating orbit of small planetoid starting from observed position.				
Course content: 1. Introduction: Gravitational theory of the movements of the planetoids and comets. Units for mass, length and time. Numerical integration of differential equation of the movement of celestial bodies. 2. Undisturbed motion. Integrals of differential equation of Kepler's motion. Orbit types and orbit motion. Position and velocity of the body. Orbital elements as constant of the integrals. Initial conditions and calculation of the orbital elements from them. Lagrange's mean elements. 3. Ephemeris calculation. Ephemeris of the planetoids and comets; precise and approximate; calculation of the position. Opposition time and time of passing through perihelia. Basic calculation: analytical and numerical integration of differential equation of Kepler's motion. Observed and calculated position. 4. Orbit determination. Undisturbed orbits of planetoids and comets. Basic principle for their determination with Earth-based observations. Orbit determination as method for calculation of the initial condition for motion on undisturbed orbit. a) Determination of circular orbit (Gauss-Encke method) b) Determination of elliptical orbit (Gauss-Encke, Laplace-Leuschner and Veisel methods) c) Determination of parabolic orbit (Olbers method)				
Literature: 1. J. L. Simovljević: Osnove teorijske astronomije , Građevinska knjiga, Beograd, 1977 2. Andrea Milani and Giovanni F. Gronchi: Theory of Orbit Determination , Cambridge University Press, 2010				
Number of hours: 5	Lecures: 3	Tutorials: 2	Laboratory: -	Research: -
Teaching and learning methods: Frontal, Group, Lectures, Exercises				
Assessment (maximal 100 points)				
Course assignments	points	Final exam	points	
Lectures	20	Written exam	20	
Exercises / Tutorials	-	Oral exam	40	
Colloquia	20	Written-oral exam		
Essay / Project	-			