Study programmes: BACHELOR STUDIES – Astronomy and Astrophysics	
Course name: Theoretical Mechanics	
Lecturers: Sunčica Elezović-Hadžić and other lecturers	
Status: Optional	
ECTS: 6	
Attendance prerequisites: Mathematics 1 and 2, Physical mechanics	
Course aims: Introduction to the basics of the contemporary theoretical physics.	

Course outcome: Students should acquire the fundamental concepts and formalisms of analytical and continuum mechanics. In particular, they should learn Lagrange and Hamilton formalism applied on discrete systems, as well as basic theoretical methods used in continuum mechanics.

Course content:

1. Basic concepts of classical nonrelativistic systems. Fundamental theorems of classical mechanics and corresponding laws of conservation. 2. Motion with constraints. D'Alembert-Lagrange principle. 3. Lagrange's equations. 4. Systems with one degree of freedom. 5. Small oscillations of conservative systems with stationary constraints. Normal modes. 6. Central conservative forces. Kepler problem. 7. The two-body problem. 8. Scattering cross-sections. Rutherford scattering. 9. Rigid body kinematics. Kinetic energy, angular momentum and tensor of inertia. Coriolis theorem and Euler equations for the rigid body. Analytical method for the rigid body dynamics. 10. Hamilton's equations. Symmetry and conservation laws. 11. Hamilton's principle. 12. Canonical transformations. 13. Continuum hypothesis, Eulerian and Lagrangian description of motion, material derivative. Strain rate tensor and vorticity vector. 14. Body and surface forces, stress vector and stress tensor. Continuity equation. Fundamental equation of continuous matter motion. 15. Ideal fluids. Navier-Stokes fluids. Elastic body.

Literature:

1. Đ. Mušicki, Uvod u teorijsku fiziku I (Teorijska mehanika), Naučna knjiga, Beograd, 1980
2. B. Milić, Kurs klasične teorijske fizike, prvi deo, Njutnova mehanika, Studentski trg, Beograd
3. S. Elezović-Hadžić, Beleške za predavanja iz Teorijske mehanike sa rešenim zadacima (ebook)
4. T.W. Kibble and F.H.Berkshire, Classical mechanics, Addison Wesley Longman Limited 1996

Number of hours: 8	**Lectures**: 4	**Tutorials**: 4	**Laboratory**: -	**Research**: -

Teaching and learning methods:
Lectures, practical classes, homeworks, consultations

Assessment (maximal 100 points)				
Course assignments	**points**	**Final exam**	**points**	
Lectures	-	Written exam	13	
Exercises / Tutorials	15	Oral exam	50	
Colloquia	-	Written-oral exam	-	
Essay / Project	22			