Study programs: Bachelor studies – Astronomy and astrophysics, Mathematics

Course name: Rational Mechanics 1

Lecturers: Anđelka Kovačević

Status: Compulsory

ECTS: 5

Attendance prerequisites: No prerequisites

Course aims: Mathematical study of the movement generated by the specific forces. Representation of the trajectories of the moving bodies.

Course outcome: Upon course completion, students are able to understand basic kinematic concepts as well as static and kinetic balance between forces which is prerequisite for development of wide spectrum of machinery.

Course content:

World of events. Galileo's transformations. Coordinate systems and its transformations. Tangential and cotangent stratification of the R3 space. Arc length. Equation of the movement of the single point. Speed of the single particle. Generalized speed, sector speed. Acceleration of the point, coordinates of the acceleration vector. Affine transformation of the Euclidian space. Oilers angles. Translatory movement. Speed and acceleration of the single point in translatory movement. Dynamics of material point. Body, mass, force (basic properties). Newtonian axioms. Differential equation of the movement of material point in curvilinear coordinates. Equations of the motion. Movement of the material point in the given field. Movement of the point around the equilibrium position. Movement of the point in the Earth gravitational field. Projectile motion. Theorem of the momentum and its integral. Potential and kinetic energy. Theorem of the kinetic energy change. Energy integral. Central forces. Newton's law of the gravity. Movement of the point in the gravitational field. Bine's formula. Movement of the material point on the surface in different coordinates. Integral of kinetic momentum. Energy integral for movement of the point on the surface. Spherical pendulum. Mathematical pendulum. Differential equation of the material point in the non-inertial reference system. Relative movement of the point in the respect of the Earth.

Literature:

1. T. Anđelić, P. Stojanović, *Racionalna mehanika*, Beograd, 1965
2. Daniel Arovas, Lecture Notes on Classical Mechanics (A Work in Progress), ebook, University of California, USA, 2013
3. A. Kovačević, lecture notes

Number of hours: 5	**Lecures: 3**	**Tutorials: 2**	**Laboratory: -**	**Research: -**

Teaching and learning methods: Frontal, Interactive, Tutorial, Lectures, Exercises

Assessment (maximal 100 points)

Course assignments	**points**	**Final exam**	**points**
Lectures	15	Written exam	25
Exercises / Tutorials	15	Oral exam	25
Colloquia	-	Written-oral exam	
Essay / Project	20		