UNIVERSITY OF NIŠ

Course Unit Descriptor	Faculty	Faculty of Mechanical Engineering

GENERAL INFORMATION			
Study Program	**Mechanical Engineering**		
Study Module (if applicable)	-		
Course Title	Analytical mechanics		
Level of Study	☐Bachelor	☐ Master's	☒ Doctoral
Type of Course	☒ Obligatory	☐ Elective	
Semester	☐ Autumn	☒ Spring	
Year of Study	I		
Number of ECTS Allocated	10		
Name of Lecturer/Lecturers	Ratko Pavlovic		
Teaching Mode	☒ Lectures ☐ Laboratory work ☐ Distance learning	☐ Group tutorials ☒ Project work ☐ Blended learning	☒ Individual tutorials ☒ Seminar ☐ Other

Purpose and Overview (max. 5 sentences)

To familiarize students with the differential and integral principles of theoretical mechanics. To acquire knowledge of theoretical mechanics..

Syllabus (brief outline and summary of topics, max. 10 sentences)

Theory classes:
Differential equations of motion of a system of particles. Free and non-free systems. Constraint and their classification. Possible virtual displacements. Ideal connection. The general dynamic equation. Lagrange equations of the first kind. The principle of virtual displacements. D'alambert principle. Holonomic systems. Independent coordinates. Generalized force. Lagrange equations of the second kind and their testing. Theorem on the change of total energy. Potential, gyroscopic and dissipative forces. Equations for non-holonomic systems. Equations of motion in a potential field. Lagrange's equations in the case of potential forces. Generalized potential. Unnatural systems. Hamilton's canonical equations. Ruth equation. Cyclic coordinates. Poisson brackets.

Variational principle and integral invariants. Hamilton's principle and his second form. Fundamental (Poincaré - Cartan) integral invariant mechanics. Generalized conservative systems. Whittaker equation. Jacobi equation. Maupertuis - Lagrange principle of least action. Move by inertia. Links with the geodesic paths in random motion of the conservative system. Poincare universal integral invariant. Invariance of volume in phase space. Louisville's theorem.

Canonical transformations and Hamilton-Jacobi equations. The canonical transformation. Available canonical transformation. Hamilton-Jacobi equations. The method of separation of variables. Application of canonical transformation in the theory of the disorder. The structure of arbitrary canonical transformation. The criterion that the canonical transformation. Lagrange brackets. Simplexity Jacobi matrix of the canonical transformation

Guided independent research:
Prepare students for research in their doctoral dissertation.

Language of Instruction

☒Serbian (complete course) ☒ English (complete course) ☐ Other _____ (complete course)

☐Serbian with English mentoring ☐Serbian with other mentoring _____

Assessment Methods and Criteria

Pre exam Duties	**Points**	**Final Exam**	**Points**
Activity During Lectures	**0**	**Written Examination**	**0**
Practical Teaching	**40**	**Oral Examination**	**Max. 60**
Teaching Colloquia	**0**	**Overall Sum**	**100**

***Final examination mark is formed in accordance with the Institutional documents**