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| **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 | ☐ Group tutorials | ☒ Individual tutorials |
| ☐ Laboratory work | ☒ Project work | ☒ Seminar |
| ☐ Distance learning | ☐ Blended learning | ☐ 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** |