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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | Faculty of Occupational Safety in Niš |
| **GENERAL INFORMATION** |
| Study program  | Environmental Protection |
| Study Module (if applicable) | / |
| Course title | Thermodinamics with thermotechnics |
| Level of study | ☒ Bachelor ☐ Master’s ☐ Doctoral |
| Type of course | ☒ Obligatory ☐ Elective |
| Semester  | ☐ Autumn ☒ Spring |
| Year of study  | Second year |
| Number of ECTS allocated | 6 |
| Name of lecturer/lecturers | Ljiljana Živković, Miomir Raos |
| Teaching mode |  ☒Lectures ☒ Group tutorials ☐ Individual tutorials ☐Laboratory work ☒ Project work ☒ Seminar ☐Distance learning ☐ Blended learning ☐ Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| *Students acquire knowledge that helps them set mass and energy balances for thermal devices and processes inside them. Students will be able to determine thermodynamic quantities of the state of an ideal gas and real fluids and to use calculations pertaining to heat propagation.* |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| Introduction. Thermodynamic system and the environment. Working body. State quantities. Balance, change of state, process. Zero principle of thermodynamics. Fundamental equation of state of an ideal gas. Corrections for a real gas. Law of conservation of energy. The term energy. Internal energy. Enthalpy. Heat capacity. Meyer’s equation. The first principle of thermodynamics for a closed and open thermodynamic system. Work diagram and changes of state inside it. The second principle of thermodynamics. Definitions. The term entropy. Reversible, irreversible, and impossible processes. Mathematical expression of the second principle of thermodynamics. Heat diagram and changes of state inside it. Entropy change of ideal gases. Entropy and entropy generation during exchange of heat, matter, and work. Right-handed and left-handed circular cycles. The first and second principle of thermodynamics for a circular cycle. Ideal Carnot cycle. Thermodynamic cycles. Thermodynamic degree of utilization. Maximum work. Energy, exergy, and anergy. Application of the exergy concept: exergy losses and exergy efficiency. Sankey diagram. Grassmann diagram. The third principle of thermodynamics. Real gases and vapours. Thermodynamic cycles with real gases. Rankine-Clausius cycle. Heat propagation. Heat propagation by conduction. Convective heat propagation. Free and forced convection. Heat transmission coefficient. Thermal criteria of similarity. Heat passage. Heat propagation by radiation. Fundamental laws of heat radiation. Heat exchangers with parallel, reverse, and cross-flow; calculation of final temperatures; calculation of exchanger heating surface. Fundamentals of combustion. |
| **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** | **10** | **Written examination** | **20** |
| **Practical teaching** | **10** | **Oral examination** | **30** |
| **Teaching colloquia** | **30** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |