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|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty** | Faculty of technology |
| **GENERAL INFORMATION** |
| Study program  | **Chemical technologies** |
| Study Module (if applicable) |  ECOLOGICAL ENGINEERING MODULE |
| Course title | Process measurement techniques |
| Level of study | ☒Bachelor ☐ Master’s ☐ Doctoral |
| Type of course | ☒ Obligatory☐ Elective |
| Semester  | ☐ Autumn ☒Spring |
| Year of study  | 2nd |
| Number of ECTS allocated | 6 ECTS |
| Name of lecturer/lecturers | Ivica S. Stamenkovic |
| Teaching mode | ☒Lectures ☐Group tutorials ☐ Individual tutorials☒Laboratory work ☐ Project work ☐ Seminar☐Distance learning ☐ Blended learning ☐ Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| *Recognizing the position and role of metric system in process engineering. Acquiring knowledge of sensors and methods of measuring the base units in chemical industry. Mastering inapplication of modern devices, software tools and virtual instrumentation for the needs of measuring. Students can choose and operate with measuring equipment on their own for the needs of measuring certain physical values in laboratory and industrial conditions. Accurate valuation of the obtained results.*  |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| **Lectures: 1. Introduction to process measurement techniques. Metrology and electrometrology. Principles of measuring non-electrical values using electrical manner. (2); 2. Structures and elements of metric systems: sensors (converters), elements for adapting and transferring of the measured signals, intensifiers, elements for signal processing and elements for displaying the measured signals. Basic methods of measuring (4); 3. General characteristics of sensors (converters). Types and classification of sensors. Statistic characteristics of sensors. Dynamic characteristics of sensors (2); 4. Statistic characteristics of measuring. Types and samples of the error measuring appearance. Histogram. 5. Function of distribution. Evaluation of population parameters by sample (4); 6. Interval of trust for the expected value and variation, chi-square test for suitability of statistic models (2); 7. Linear regression and correlation. Calibration of instruments (2); 8. Measuring of physical values in process engineering. Measuring of mass. Measuring of levels. Measuring of displacement (4); 9. Measuring of flow. Measuring of force. Measuring ofpressure. (4); 10. Measuring of temperature. Measuring of humidity (2); 11. Measuring of content. Biochemical sensors (2); 12. Computing metric system. Industrial metric system. Basic elements and ways of connecting the computing metric systems (2).****Practical teaching: Calculation exercises (0+1)**1. **Data work in Excel. Basic functions of Excel in data work. Storage and graphic displaying of data in Excel (5);**
2. **Errors of measuring. Histogram. Functions of distribution. Normal distribution. Practical work in Excel (4)**
3. **Evaluation of population parameters. Interval of trust for the expected value. Interval of trust for variation. Practical work in Excel (2)**
4. **Chi-square test. Linear regression and calibration. Practical work in Excel (4)**

**Laboratory work (0+1)**1. **Using of Excel for storage, processing and displaying of measured data (5)**
2. **Measuring of mass. Measuring of pressure (3)**
3. **Measuring of temperature. Measuring of humidity (3)**
4. **Measuring of ph. Measuring of electrical conductivity of solutions (3)**
5. **Measuring the concentration of oxygen in liquid environment (1)**
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| **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** | **5** | **Written examination** |  |
| **Practical teaching** | **5** | **Oral examination** | **50** |
| **Teaching colloquia** | **40** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |