|  |
| --- |
|  **UNIVERSITY OF NIŠ** |
| **Course Unit Descriptor** | **Faculty**  | Faculty of Electrical Engineering |
| **GENERAL INFORMATION** |
| Study program  | Telecommunications |
| Study Module (if applicable) | Radiocommunication engineering and technologies |
| Course title | Adaptive antennas and MIMO systems |
| Level of study | [ ] Bachelor [x]  Master’s [ ]  Doctoral |
| Type of course | [ ]  Obligatory [x]  Elective |
| Semester  |  [ ]  Autumn [x] Spring |
| Year of study  | 1 |
| Number of ECTS allocated | 4 |
| Name of lecturer/lecturers | Dončov S. Nebojša, Stanković Ž. Zoran |
| Teaching mode |  [x] Lectures [ ] Group tutorials [ ]  Individual tutorials [x] Laboratory work [ ]  Project work [ ]  Seminar [ ] Distance learning [ ]  Blended learning [ ]  Other |
| **PURPOSE AND OVERVIEW (max. 5 sentences)** |
| The acquisition of theoretical and practical knowledge of the spatial signal processing techniques in wireless communications which are based on the use of adaptive antennas and MIMO (Multiple Input - Multiple Output) systems. Knowledge of the basic techniques of signal spatial processing and working methods of the adaptive antennas. The ability to apply basic methods of shaping the antenna array radiation pattern in the construction of adaptive antennas. Knowledge of techniques of signal transmission using MIMO (multiple-input and multiple-output) antennas (MIMO systems). The ability to apply adaptive antenna in practice. |
| **SYLLABUS (brief outline and summary of topics, max. 10 sentences)** |
| EM waves characterization in the space-time domain. Spatial filtering of the signal and SDMA concept. Antenna arrays with controllable radiation patterns. Butler's matrix. Scanning antenna arrays. Algorithms for determining the direction of arrival (DoA) of EM radiation (MUSIC, ESPRIT). Adaptive antenna arrays. Adaptive beamforming in the temporal and spatial domain. Wiener solution. MIMO systems. (Architecture, spatial communication channel, processing in the space-time domain). Application of antenna arrays in wireless communications. Solving practical problems related to antenna аrray beamforming. Solving practical problems related to DoA estimation of the EM signals. |
| **LANGUAGE OF INSTRUCTION** |
| [ ] Serbian (complete course) [x]  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** | **20** |
| **Practical teaching** | **30** | **Oral examination** | **20** |
| **Teaching colloquia** | **25** | **OVERALL SUM** | **100** |
| **\*Final examination mark is formed in accordance with the Institutional documents** |