

## Specification for the book of courses

|  |   |   |                                |                      |
|--|---|---|--------------------------------|----------------------|
| <b>Study program</b>   |   | Electrical Engineering and Computer Science   |                                |                      |
| <b>Module</b>  |   | Communications and Information Technologies - Communications and Information Processing |                                |                      |
| <b>Type and level of studies</b>   |   | Undergraduate Academic Studies  |                                |                      |
| <b>The name of the course</b>  |   | Radar technology and radiolocation  |                                |                      |
| <b>Lecturer (for lectures)</b>   |   | Milić N. Dejan  |                                |                      |
| <b>Lecturer/associate (for exercises)</b>  |   | Anastasov A. Jelena   |                                |                      |
| <b>Lecturer/associate (for OFE)</b>  |   | Anastasov A. Jelena   |                                |                      |
| <b>Number of ECTS</b>  | 5   | <b>Course status (obligatory/elective)</b>  | Elective                       |                      |
| <b>Prerequisites</b>   |   |   |                                |                      |
| <b>Course objectives</b>   | Mastering the basic knowledge necessary to determine the performance of digital modulation techniques.  |   |                                |                      |
| <b>Course outcomes</b>   | Students will be able to understand, classify and analyze radar systems, and come with signal processing solutions related to the specified applications  |   |                                |                      |
| <b>Course outline</b>  |   |   |                                |                      |
| <b>Theoretical teaching</b>  | Radar range, signal-to-noise ratio, radar cross-section, ambiguities of range and velocity, background signals, detection and architecture of the receivers, transmitters, and antenna systems. Design of signals and pulse compression. Optimal filtering for radar signal in white and colored Gaussian noise. Likelihood ratio. Detection of radar signals based on multiple observations. Radar signal parameter estimation. Variable amplitude, phase, and frequency of radar signals. Influence of Doppler effect. Decision criteria. Radar signal random signal analysis. Applications of pulse, continuous, FM, Doppler radars, and synthetic aperture radars. Sonar and Lidar. |   |                                |                      |
| <b>Practical teaching (exercises, OFE, study and research)</b>                       | Auditory exercises that deal with the types of problems required for colloquia and final examination. Laboratory work will be organized according to the number of students and their affinities.   |   |                                |                      |
| <b>Textbooks/references</b>  |   |   |                                |                      |
| 1  | Merrill I. Skolnik, Introduction to Radar Systems, McGraw-Hill, 2003  |   |                                |                      |
| 2  | Mark A. Richards, Fundamentals of Radar Signal Processing, McGraw-Hill, New York, 2005  |   |                                |                      |
| 3  | François Le Chevalier, Principles of Radar and Sonar Signal Processing, Artech House, 2002  |   |                                |                      |
| 4  |   |   |                                |                      |
| 5  |   |   |                                |                      |
| <b>Number of classes of active education per week during semester/trimester/year</b> |   |   |                                |                      |
| <b>Lectures</b>  | <b>Exercises</b>  | <b>OFE</b>  | <b>Study and research work</b> | <b>Other classes</b> |
| 2  | 2   | 1   | 0                              | 0                    |
| <b>Teaching methods</b>  | Theory classes, auditory and laboratory exercises, homework, consultations.   |   |                                |                      |
| <b>Grade (maximum number of points 100)</b>  |   |   |                                |                      |
| <b>Pre-exam duties</b>   | <b>Points</b>   | <b>Final exam</b>   | <b>Points</b>                  |                      |
| <b>Activity during lectures</b>  | 5   | <b>Written exam</b>   | 30                             |                      |
| <b>Exercises</b>   | 15  | <b>Oral exam</b>  | 20                             |                      |
| <b>Colloquia</b>   | 30  |   |                                |                      |
| <b>Projects</b>  |   |   |                                |                      |