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| <b>Study program:</b> Mechanical engineering                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                       |                              |                        |
| <b>Type and level of studies:</b> Doctoral studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       |                              |                        |
| <b>Course unit:</b> Robot control 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                       |                              |                        |
| <b>Teacher in charge:</b> Prof. dr Novak Nedić                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |                              |                        |
| <b>Language of instruction:</b> English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                              |                        |
| <b>ECTS:</b> 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |                              |                        |
| <b>Prerequisites:</b> None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |                              |                        |
| <b>Semester:</b> Autumn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                              |                        |
| <b>Course unit objective:</b><br>Introducing students to modern control concepts for stationary and mobile robots as well as their realizations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |                              |                        |
| <b>Learning outcomes of the course unit</b><br>Students are able to research in a domain of modern robot control.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                              |                        |
| <b>Course unit contents</b><br><i>Theoretical classes</i><br>Kinematics and dynamics of stationary and mobile robot in a real situation.<br>Control of stationary and mobile robots in a real situation. Control systems.<br>Robot programming. Sensors in robotics.<br><i>Practical classes</i><br>Kinematics and dynamics of stationary and mobile robot in a real situation.<br>Control of stationary and mobile robots in a real situation. Control systems.<br>Robot programming. Sensors in robotics.                                                                                                                             |                       |                              |                        |
| <b>Literature</b><br>1) R.J. Schilling, Fundamentals of Robotics: Analysis and Control, Prentice Hall, 1990<br>2) M.W. Spong, M. Vidyasagar, Robot Dynamics and Control, John Wiley & Sons, Inc., 1989<br>3) L. Sciavicco, B. Siciliano, Modelling and Control of Robot Manipulators, McGraw-Hill, 1996<br>4) J. Craig, Introduction to Robotics: Mechanics and Control, Addison-Wesley Publishing Company, 1989<br>5) L.T. Groyitch, Robotique Avancée, Belfort, 2000<br>6) L.T. Groyitch, La Robotique, Belfort, 1994<br>7) R. Paul, Robot Manipulators: Mathematics, Programming, and Control, The MIT Press Cambridge, London, 1981 |                       |                              |                        |
| <b>Number of active teaching hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                       |                              | <b>Other classes</b>   |
| Lectures:<br>3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Practice:<br>0        | Other forms of classes:<br>0 | Independent work:<br>0 |
| <b>Teaching methods</b><br>Teaching is carried out on "a blackboard" with the use of multimedia contents, as well as simulation and experimental examples.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |                              |                        |
| <b>Examination methods ( maximum 100 points)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                       |                              |                        |
| <b>Exam prerequisites</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>No. of points:</b> | <b>Final exam</b>            | <b>No. of points:</b>  |
| Student's activity during lectures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                       | oral examination             | 45                     |
| practical classes/tests                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       | written examination          |                        |
| Seminars/homework                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 55                    | .....                        |                        |
| Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                              |                        |
| Other                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                              |                        |
| <b>Grading system</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                              |                        |
| <b>Grade</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>No. of points</b>  | <b>Description</b>           |                        |
| <b>10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>91-100</b>         | Excellent                    |                        |
| <b>9</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>81-90</b>          | Exceptionally good           |                        |
| <b>8</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>71-80</b>          | Very good                    |                        |
| <b>7</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>61-70</b>          | Good                         |                        |
| <b>6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>51-60</b>          | Passing                      |                        |
| <b>5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Less than 50</b>   | Failing                      |                        |