

| Add. 3 |   | Course program for the first, second and third level (cycle) of studies                  |                        |               |           |      |
|--------|---|--|------------------------|---------------|-----------|------|
| 1.     | Course title  | Design of automation control systems   |                        |               |           |      |
| 2.     | Code  | 271  |                        |               |           |      |
| 3.     | Study group(s)  | ACS  |                        |               |           |      |
| 4.     | The organizer of the study program (unit, institute, department)  | Faculty of Mechanical Engineering - Skopje, Ss. Cyril and Methodius University in Skopje |                        |               |           |      |
| 5.     | Level (first, second, third)  | First  |                        |               |           |      |
| 6.     | Academic year / semester  | summer   | 7.                     | ECTS credits  | 6         |      |
| 8.     | Instructor  | prof. d-r AtanaskoTuneski  |                        |               |           |      |
| 9.     | Prerequisites   | Systems of automation control - passed   |                        |               |           |      |
| 10.    | Course objectives (competences): Calculation, simulation and design of the systems of automation control. Mathematical modeling of plants, analysis and simulation of static and dynamic characteristics using MATLAB. Design of complete system of automation control systems using PLC, design of the user interface using SCADA software.  |  |                        |               |           |      |
| 11.    | Course content: Mathematical modeling of plants and systems <ul style="list-style-type: none"> <li>- Definition of mathematical model in MATLAB and SIMULINK, analysis of static and dynamic characteristics of modeled systems using simulation</li> <li>- Design of control law using MATLAB, stability analysis, static and dynamic characteristics.</li> <li>- Selection of control law according to project assignment</li> <li>- Real time simulation of the modeled system using MATLAB, controlling of the modeled system using real PLC</li> <li>- Design of user interface for real time control</li> <li>- Selection of best model according to project criterions.</li> </ul> |  |                        |               |           |      |
| 12.    | Study methods: Interactive teaching, laboratory and/or auditory exercises, standalone and/or team project work, standalone learning.  |  |                        |               |           |      |
| 13.    | Total hours   | 6ECTSx30 classes = 180 hours   |                        |               |           |      |
| 14.    | Hours allocation per activity:  | 30 + 30 + 30 + 30 + 60 = 180 hours   |                        |               |           |      |
| 15.    | Lectures/Lab  | 15.1.  | Lectures               | 30 hours      |           |      |
|        |   | 15.2.  | Lab (student work)     | 30 hours      |           |      |
| 16.    | Project Work/Assignments  | 16.1.  | Project assignments    | 30 hours      |           |      |
|        |   | 16.2.  | Individual assignments | 30 hours      |           |      |
|        |   | 16.3.  | Self-study             | 60 hours      |           |      |
| 17.    | Points/Marks:   |  |                        |               |           |      |
|        | 17.1.   | Tests  | 70 points              |               |           |      |
|        | 17.2.   | Projects   | 20 points              |               |           |      |
|        | 17.3.   | Attendance   | 10 points              |               |           |      |
| 18.    | Grading scale   | Under 50   |                        | 5 (five) (F)  |           |      |
|        |   | 51 - 60 points   |                        | 6 (six) (E)   |           |      |
|        |   | 61 - 70 points   |                        | 7 (seven) (D) |           |      |
|        |   | 71 - 80 points   |                        | 8 (eight) (C) |           |      |
|        |   | 81 - 90 points   |                        | 9 (nine) (B)  |           |      |
|        |   | 91 - 100 points  |                        | 10 (ten) (A)  |           |      |
| 19.    | Prerequisites for taking the final exam   | Finished seminar assignments   |                        |               |           |      |
| 20.    | Language of Instruction   | Macedonian   |                        |               |           |      |
| 21.    | Course evaluation   | Student questionnaire  |                        |               |           |      |
| 22.    | Textbooks   |  |                        |               |           |      |
|        | 22.1.   | Instruction materials  |                        |               |           |      |
|        |   | No.  | Author                 | Title         | Publisher | Year |

|  |       |                                    |                         |   |  |      |
|--|-------|------------------------------------|-------------------------|---|--|------|
|  |       | 1.                                 | M.R. Stojic             | Continual systems of automatic control          | Naucna knjiga Beograd                      | 1985 |
|  |       | 2.                                 | A. Tuneski, D. Babunski | Programmable memory control (internal script)   | Faculty of Mechanical Engineering - Skopje | 2009 |
|  |       | 3.                                 | A. Tuneski, E. Zaev     | Remote monitoring and control (internal script) | Faculty of Mechanical Engineering - Skopje | 2012 |
|  |       | Supplemental Instruction Materials |                         |   |  |      |
|  | 22.2. | No.                                | Author                  | Title   | Publisher                                  | Year |
|  |       | 1.                                 | Laze Trajkovski         | Control techniques (internal script)            | Faculty of Mechanical Engineering - Skopje | 2008 |