

SYLLABUS

1. Course title:

Actuators

2. Code:

AR203

3. Cycle of study:

1

4. ECTS credits:

6

5. Type of course: Mandatory Elective**6. Prerequisites:**

[ESKE001, ESKE002] Fundamentals of Electrical Engineering I and II, [AR103] Linear Automatic Control Systems I

7. Class restrictions:**8. Duration / semester:**

1

6

9. Weekly contact hours:

9.1. Lectures:

3

9.2. Seminars:

1

9.3. Laboratory/Practice classes:

1

10. Faculty:

Faculty of Electrical Engineering

11. Department/study program:

Electrical Engineering and Computer Science

12. Lecturer:

PhD. Jakub Osmic, associate professor

13. Lecturer's e-mail:

jakub.osmic@untz.ba

14. Web site:

(max. 50 characters)

15. Course aims:

Introducing students with electric, hydraulic and pneumatic actuators. Introducing students with electrical, hydraulic and pneumatic control. Introducing students with elements of electric, hydraulic and pneumatic control circuits. Introducing students with power electronic switches, power amplifiers and power converters. Familiarizing students with process documentation, process diagrams, flow diagrams, electrical, hydraulic and pneumatic schemes and symbols of process elements, actuators and instrumentation.

16. Learning outcomes:

At the end of the semester successful students will be trained to:

- performs the classification and selection of power electronic switches and inverters according to the specific application
- performs analysis of power electronic circuits
- designing power electronic circuits and circuits for power switches and converters
- handle software packages to analyze power electronic circuits
- classifying and selecting electrical pneumatic and hydraulic actuators according to the specific application
- performs analysis and synthesis of the automatic control system with electrical, pneumatic and hydraulic actuators

17. Course content:

Introduction into actuators and division of the actuators. Electric, hydraulic, pneumatic and micro-actuators. Introduction to Power Electronics. Electrical power switches. Thermal characteristics and cooling power switches. Power diodes, bipolar transistors, Darlington pairs and MOS transistors. IGB transistors. Thyristors. Power inverters and divisions. DC linear and pulse power supplies. Single-phase and three-phase diode non-adjustable rectifiers. Controllable thyristor and transistor AC / DC Converters. DC / DC converters. Autonomous voltage inverters. Single phase and three phase PWM converters. Voltage AC convertors of Direct type. Convertors of AC voltage and frequency of the indirect type. Frequency converter. Electrical actuators and motors. Division of electrical machines. Mechanical characteristics electrical machine and loads. Separately excited DC Motor (SEDC Motor). Electrical drives with SEDC motors. Squirrel cage and wound rotor induction motors. Scalar control of electrical drives with asynchronous motor. Hydraulic and pneumatic actuators.

18. Learning methods:

The following learning methods are planned:

- lectures
- auditorial exercises
- laboratory exercises
- project Tasks
- educational visits to firms that use actuators and power electronics devices.

19. Assessment methods:

At the end of the first third of the semester, the students hold the first colloquium that consists of 3 to 4 theoretical questions from the previously studied subject at the lectures. At the end of the second third of the semester, students hold the second colloquium, which consists of 3 to 4 questions from the lecture. In addition to this, at the end of the first half of the semester, students hold a colloquium that consists of tasks related to analysis and design of power electronic circuits. The duration of each colloquium is two school hours. All colloquia is only hold in writing form. At each colloquium, students can achieve a maximum of 100 points, with a total of the theoretical part of the colloquium taking part in the total assessment with the weight factor of $\frac{1}{4}$, while the tasks (calculus) exam takes part in the overall assessment with the weight factor of $\frac{15}{100}$. Students at each colloquy must achieve at least 54 points In the second half of the semester, students conduct laboratory exercises related to the analysis and design of power electronics circuits and the use of electrical actuators. Laboratory exercises are performed using the available laboratory equipment as well as simulations using the Matlab / Simulink and Multisim software packages. After each laboratory exercise, students are required to submit a report on the results of laboratory exercises on the next laboratory exercises. At the final exam, students can achieve a maximum of 100 points, with the weight factor of the final exam $\frac{1}{4}$. The minimum number of points that students have to complete on the final exam is 54. On the final exam, students answer the questions asked in a written form at duration of one school hour, then answer the questions verbally. For student activity, students can earn up to 5 points. Also, for the presence of lectures students can achieve a maximum of 5 points.

20. Assessment components:

Students cumulatively on the exam can achieve 100 points
For pre-exam activities, students can achieve a maximum of 75 points
The first colloquium (theory):
54-100 points, weight factor $\frac{1}{4}$
The second colloquium (theory):
54 - 100 points, weight factor $\frac{1}{4}$
The first colloquium (tasks):
54 - 100 points, weight factor 15/100
Activity in lectures: 5 points, weight factor 1
Attendance: 5 points, weight factor 1
Final exam: 54 - 100 points, weight factor $\frac{1}{4}$.

21. Required reading list:

P. Gugić, "Električni servomotori", Školska knjiga, Zagreb, 1987.
V. Vučković, "Električni pogoni", Akademska misao, Beograd, 2002.
T. Brodić, "Osnove energetske elektronike 1. dio", Školska knjiga, Zagreb, 2002.

22. Web sources:

(max. 687 characters)

23. Applicable starting from the academic year:

2016/2017

24. Adopted in the Faculty/Academy session:

04.04.2016.