

## DESCRIPTION OF THE COURSES

- Course code: ELR2170
- Course title: FUNDAMENTALS OF CONTROL ENGINEERING 2
- Language of the lecturer: Polish

<i>Course form</i>	<i>Lecture</i>	<i>Classes</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Number of hours/week*</i>	1		2		
<i>Number of hours/semester*</i>	10		20		
<i>Form of the course completion</i>	exam		pass		
<i>ECTS credits</i>	4		2		
<i>Total Student's Workload</i>	120		60		

- Level of the course (basic/advanced): basic
- Prerequisites:  
completed course: Fundamentals of Control Engineering 1
- Name, first name and degree of the lecturer/supervisor:  
Janusz Szafran, Prof., Ph. D., D. Sc.
- Names, first names and degrees of the team's members:  
Andrzej Wiszniewski, Prof., Ph. D., D. Sc.  
Jan Iżykowski, Ph. D., D. Sc.  
Waldemar Rebizant, Ph. D., D. Sc.  
Marek Michalik, Ph. D.  
Mirosław Łukowicz, Ph. D.  
Janusz Staszewski, Ph. D.
- Year: 4      Semester: 7
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course):  
As an effect of the course completion the students are expected to present the knowledge on the theory of discrete and non-linear control systems, their quality, stability as well as design and analysis of industrial controllers and compensation units for discrete control systems. The students should show the ability of solving practical problems related to the theory presented during lectures.
- Form of the teaching (traditional/e-learning): traditional
- Course description:  
The course consists of the lecture and the laboratory. The laboratory covers the syllabus of both courses: FUNDAMENTALS OF CONTROL ENGINEERING 1 and 2, while the lecture deals with the following topics: structure of discrete control systems, difference equations, discrete transfer function, block-diagram algebra. Steady state errors, stability analysis of discrete control systems, state space methods of discrete control systems description. Non-linear control systems - method of describing function and methods of stability analysis.
- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
<i>A. DISCRETE CONTROL SYSTEMS.</i>	
<i>1. Structure of discrete control systems.</i>	<i>1</i>
<i>2. Sampler and hold elements.</i>	<i>1</i>
<i>3. Direct and inverse Z transformation, difference equations.</i>	<i>1</i>
<i>4. Discrete transfer function.</i>	<i>1</i>
<i>5. Block-diagram algebra.</i>	<i>1</i>
<i>6. Steady state errors in discrete control systems.</i>	<i>1</i>
<i>7. Basic stability condition.</i>	<i>1</i>
<i>8. Bi-linear transformation, use of stability criteria designated for linear continuous control systems.</i>	<i>1</i>
<i>9. Jury stability criterion.</i>	<i>1</i>
<i>10. Synthesis of discrete control systems.</i>	<i>1</i>

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
  1. Analysis methods for linear continuous control systems.
  2. Analogue compensation of linear continuous control systems.
  3. Investigation of industrial controllers.
  4. Modelling of control systems with use of MATLAB package.
  5. Synthesis and analysis of combinatorial and sequential logic circuits.
  6. Control of electric motor with use of PLC.
  7. Investigation of linear discrete control systems.
  8. Microprocessor sequential controllers.
- Project – the contents:
- Basic literature:
  - [1] Kaczorek T., Teoria sterowania i systemów, PWN, Warszawa 1999.
  - [2] Greblicki W. Podstawy automatyki, PWr, Wrocław, 2001.
  - [3] Kowal J., Podstawy automatyki, t. 1 i 2, AGH, Kraków, 2004.
  - [4] Larminant P., Thomas Y., Automatyka - układy liniowe., WNT, Warszawa 1983.
  - [5] Wiszniewski A. (pod red.), Podstawy automatyki. Ćwiczenia laboratoryjne, skrypt Politechniki Wrocławskiej, Wrocław 2000.
- Additional literature:
  - [1] Katsuhiko Ogata, Modern control engineering, Prentice-Hall International Editions.
  - [2] Francis H. Raven, Automatic control engineering, International Student Edition.
- Conditions of the course acceptance/creditation:

\* - depending on a system of studies