DESCRIPTION OF THE COURSES

- Course code: ARR2115
- Course title: CONTROL THEORY
- Language of the lecturer: Polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*2*				
*Number of hours/semester**	*30*				
Form of the course completion	*exam*				
ECTS credits	*4*				
Total Student's Workload	*120*				

- Level of the course (basic/advanced):): advanced
- Prerequisites:
  completed courses: Fundamentals of Control Engineering 1,2
- Name, first name and degree of the lecturer/supervisor:
  Mirosław Łukowicz, Ph. D.
- Names, first names and degrees of the team's members:
  Marek Michalik, Ph. D.
- Year: 4 Semester: 8
- Type of the course (obligatory/optional): obligatory
- Aims of the course (effects of the course):
  The skill of analyses of linear and non-linear control systems stability. Formulation and solution finding of optimal and linear-quadratic optimal control problems.
- Form of the teaching (traditional/e-learning): traditional
- Course description:
  The course is a development of the course Fundamentals of Control Engineering 1,2. It concerns problems of designing of optimal continuous and discrete control algorithms for open- and closed-loop deterministic and probabilistic control systems.
- Lecture:

Particular lectures contents	*Number of hours*
1. Classification of control systems	
Models of control systems.	1
Discrete-time models of physical systems.	1
2. Target-state control algorithms	
Method of open-loop control design.	1
Method of feedback control design.	1
Controllability. Observability.	1
Lapunov's local stability criterion.	2
Global stability criterion.	1
Optimal control – deterministic problems	1
Dynamic programming.	2

Optimal control for continuous feedback systems. Bellman's equation.	1
Minimal-time control with limited control signal.	2
Linear-quadratic problem.	1
3. Optimal control – probabilistic problems	
Estimation of an unknown parameter measured under disturbances:	1
Least squares method.	1
Maximum likelihood method.	1
Minimal risk method.	2
4. Extreme control	
Open-loop control with known model of the controlled system.	2
Feedback control.	2
Analytical method.	1
Gradient-based method.	1
Tentative step control.	1
5. Artificial intelligence and knowledge representation in control systems	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
- Project – the contents:
- Basic literature:

[1] Bubnicki Zbigniew: Teoria i algorytmy sterowania, wyd. nauk. PWN,Warszawa 2002.

[2] Kaczorek Tadeusz: Teoria sterowania i systemów. wyd.2 popr., PWN1996.

[3] Kaczorek Tadeusz: Teoria sterowania, T.2. Układy nieliniowe, procesy stochastyczne oraz optymalizacja statyczna i dynamiczna, PWN 1981.

- Additional literature:
- Conditions of the course acceptance/credition:

***** - depending on a system of studies