**COURSE DESCRIPTION**

1. **Course title:** ADAPTIVE SYSTEMS IN CONTROL
2. **Course code:**

3. **Validity of course description:** 2016/2017

4. **Level of studies:** 2nd cycle of higher education

5. **Mode of studies:** intramural studies

6. **Field of study:** AUTOMATIC CONTROL AND ROBOTICS, ELECTRONICS AND TELECOMMUNICATION, INFORMATICS RAU

7. **Profile of studies:** general

8. **Programme:** Automatic Control

9. **Semester:** 3

10. **Faculty teaching the course:** Automatic Control, Electronics and Computer Science

11. **Course instructor:** Jerzy Mościński, PhD

12. **Course classification:** programme courses

13. **Course status:** elective

14. **Language of instruction:** English

15. **Pre-requisite qualifications:** Course attendants are supposed to have general knowledge concerning control systems analysis and design, especially with respect to modeling and simulation of such systems. Students are also supposed to possess practical skills concerning MATLAB/SIMULINK like software usage as well as programming in language of C/C++/C#/Java kind. It is assumed that students passed the following courses: Advanced Control, System Identification, Modeling and Simulation of Industrial Systems.

16. **Course objectives:** The main objective of the course is to provide the students with basic and advanced knowledge concerning theory, analysis and synthesis of adaptive control systems. During the course the students should develop the skills concerning the methods of theoretical analysis and synthesis of adaptive control systems as well as the skills of building and using computer simulation packages for analysing the behaviour of such complex control systems.

17. **Description of learning outcomes:**

<table>
<thead>
<tr>
<th>Nr</th>
<th>Learning outcomes description</th>
<th>Method of assessment</th>
<th>Teaching methods</th>
<th>Learning outcomes reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knows rules for designing and analysing adaptive control systems</td>
<td>assessment test</td>
<td>lecture</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Knows rules and methods concerning tuning of control algorithms used in adaptive control systems and choosing adaptive control algorithm type according to controlled plant features and disturbances</td>
<td>assessment test</td>
<td>lecture</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Knows the features and parameterization methods with respect to parameter estimation methods used in adaptive control systems and the effect of estimation method parameters choice on adaptive control properties and quality</td>
<td>assessment test</td>
<td>lecture</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Can choose adaptive control algorithm according to controlled plant characteristic, disturbance properties and control objectives measured by means of specific performance index</td>
<td>laboratory exercise</td>
<td>laboratory</td>
<td></td>
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<tr>
<td>5</td>
<td>Can choose sampling parameters and estimation algorithm and its parameters in order to reach desired convergence properties in adaptive control system</td>
<td>laboratory exercise</td>
<td>laboratory</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Can program in C/C++/C#Java programming languages and with MATLAB/SIMULINK platforms in order to efficiently build adaptive control system model and simulation environment</td>
<td>laboratory exercise</td>
<td>laboratory</td>
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</tbody>
</table>
7. Is able to propose adaptive control system structure and tuning scheme and convince other about its usefulness 

laboratory exercise 

laboratory

18. Teaching modes and hours

Lecture 30 h / BA / MA Seminar / Class / Project / Laboratory 15 h

19. Syllabus description:

Lecture:

Laboratory:
- Choice of structure of adaptive control systems, sampling period, measurement devices and actuators representation in simulation experiments.
- Comparison of adaptive predictive control algorithms, minimum variance control algorithms and pole/zero placement controllers.
- Choice of structure and parameters in adaptive control systems with open loop unstable and/or non-minimum phase plants.
- Numerical properties of recursive estimation algorithms in adaptive control systems.
- Synthesis of adaptive control system for nonstationary plant with typical static nonlinearities – comparison of control results for various estimation algorithms and parameters.
- Advanced MATLAB/SIMULINK based design and simulation of adaptive control systems.

20. Examination: no

21. Primary sources:

22. Secondary sources:
23. Total workload required to achieve learning outcomes

<table>
<thead>
<tr>
<th>Lp.</th>
<th>Teaching mode</th>
<th>Contact hours / Student workload hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecture</td>
<td>30/6</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>/</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>15/15</td>
</tr>
<tr>
<td>4</td>
<td>Project</td>
<td>/</td>
</tr>
<tr>
<td>5</td>
<td>BA/MA Seminar</td>
<td>/</td>
</tr>
<tr>
<td>6</td>
<td>Other</td>
<td>5/8</td>
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<tr>
<td></td>
<td>Total number of hours</td>
<td>50/29</td>
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</tbody>
</table>

24. Total hours: 79

25. Number of ECTS credits: 3

26. Number of ECTS credits allocated for contact hours: 2

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1

26. Comments:

Approved:

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(date, Instructor’s signature) (date, the Director of the Faculty Unit signature)