## COURSE DESCRIPTION

1. **Course title:** Theory of Logic Circuits  
2. **Course code:** TLC

3. **Validity of course description:** 2017/2018

4. **Level of studies:** BA, BSc programme / MA, MSc programme lub 1st cycle / 2nd cycle of higher education

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

6. **Field of study:** Interdisciplinary Studies: Automatic Control and Robotics, Electronics and Telecommunications, Computer Science  
7. **Profile of studies:** general

8. **Programme:** all

9. **Semester:** 1, 2

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

11. **Course instructor:** Prof. Krzysztof Cyran, PhD DSc

12. **Course classification:** common courses

13. **Course status:** compulsory / elective

14. **Language of instruction:** English

15. **Pre-requisite qualifications:** none

16. **Course objectives:** Theory of Logic Circuits presents to the audience a complete course covering wide aspects of modern digital system design (combinational, sequential, microprogrammable, programmable), its analysis and review. Students are presented step-by-step course on general two-value logic, numeric systems, algebra and arithmetic of digital devices, various synthesis and analysis methods related to the digital circuits along with review of digital devices and their utility.

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 various number systems and its arithmetic.</td>
<td>Written test</td>
<td>Lecture and classes</td>
<td>K1A_W4 K1A_W10</td>
</tr>
<tr>
<td>2</td>
<td>Knows algorithms for basic arithmetic operations.</td>
<td>Written test</td>
<td>Lecture and classes</td>
<td>K1A_W10 K1A_W3</td>
</tr>
<tr>
<td>3</td>
<td>Knows how to convert number between various numeric systems.</td>
<td>Written test</td>
<td>Lecture and classes</td>
<td>K1A_W10 K1A_W3</td>
</tr>
<tr>
<td>4</td>
<td>Knows Boole algebra, digital circuits structures, knows methodology on digital circuit synthesis and analysis.</td>
<td>Written test</td>
<td>Lecture, classes and laboratory</td>
<td>K1A_W1 K1A_W4 K1A_W10</td>
</tr>
<tr>
<td>5</td>
<td>Is capable to implement combinational and sequential digital circuits in various models and solutions.</td>
<td>Classes: Written test Labs: Evaluation of the circuit implemented, report.</td>
<td>Lecture, classes and laboratory</td>
<td>K1A_W10</td>
</tr>
<tr>
<td>6</td>
<td>Is capable to analyze theoretically and practically various circuits according to its correctness. Is capable to propose corrections and improvements for faulty and non-optimal circuits.</td>
<td>Classes: Written test Labs: Evaluation of the circuit implemented, report.</td>
<td>Lecture, classes and laboratory</td>
<td>K1A_U7 K1A_U12</td>
</tr>
<tr>
<td>7</td>
<td>Performs seamlessly teamwork.</td>
<td>Classes: Written test Labs: Evaluation of the circuit implemented, report.</td>
<td>Lecture, classes and laboratory</td>
<td>K1A_K3</td>
</tr>
</tbody>
</table>

18. **Teaching modes and hours**

**Lecture / BA / MA Seminar / Class / Project / Laboratory**

Sem 1 - 60 h., Sem 2 - 30 h
19. Syllabus description:

Semester 1:

Lecture:
- Numeric systems.
- Converting numbers between different numeric systems.
- Binary forms of numbers and its representation in digital systems.
- Fixed point arithmetic.
- Information and communication – digital vs analogue world.
- Digital devices, circuits and systems.
- Boolean algebra, gates and binary operators.
- System functionally complete.
- Digital systems classification.
- Combinational circuits design.
- Synthesis and analysis of combinational circuits.
- Iterative circuits.
- Sequential digital systems.
- Asynchronous sequential systems design.
- Synchronous sequential systems design.
- Dynamics of sequential systems.
- Microprogrammable circuits design.
- Programmable logic devices.

Classes:
Classroom exercises cover practice of the subjects that are closely related to the lecture, particularly insisting on real problem analysis and solution.

Semester 2:

Laboratory:
Laboratory course covers systems design on digital systems and computer systems. Students are creating and analyzing real digital systems, built of various operators and medium scale integration devices (including sequential-related components and microprogrammable related memory components).

20. Examination: none

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>30/45</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>30/45</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>30/30</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>/</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>90/120</td>
</tr>
</tbody>
</table>

24. Total hours: 210

25. Number of ECTS credits: 7

26. Number of ECTS credits allocated for contact hours: 3

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 2

28. Comments:

Approved:

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