### COURSE DESCRIPTION

1. **Course title:** DIGITAL CIRCUITS THEORY  
2. **Course code:** DCT

3. **Validity of course description:** 2018/2019

4. **Level of studies:** first degree

5. **Model of studies:** stationary

6. **Field of study:** INFORMATICS

7. **Profile of studies:** general academic

8. **Programme:** ALL

9. **Semester:** 1, 2, 3

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

11. **Course instructor:** Ph.D. Eng. Urszula Stańczyk

12. **Course classification:** general

13. **Course status:** obligatory

14. **Language:** English

15. **Pre-requisite qualifications:** elementary knowledge of mathematics and physics at the high school level

16. **Course objectives:**

   Getting acquainted with the theory and gaining practical skills in the field of: synthesis (design), implementation, and analysis of digital circuits.

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>Reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student has knowledge in the field of digital algebra, necessary to describe digital elements and circuits.</td>
<td>Test, exam, laboratory report</td>
<td>Lecture, classes, laboratory</td>
<td>K1A_W01 K1A_W02</td>
</tr>
<tr>
<td>2</td>
<td>Student has ordered, theoretically founded knowledge in the field of digital circuit structures.</td>
<td>Exam</td>
<td>Lecture</td>
<td>K1A_W05 K1A_W07</td>
</tr>
<tr>
<td>3</td>
<td>Student is capable of choosing the methods of synthesis and analysis of a digital circuit.</td>
<td>Test, exam</td>
<td>Lecture, classes</td>
<td>K1A_U08</td>
</tr>
</tbody>
</table>

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1 należy wskazać ok. 5 – 8 efektów kształcenia
<table>
<thead>
<tr>
<th></th>
<th><strong>4</strong> Student is able to design a digital circuit that implements a given algorithm in different variants and suggest its various realisations.</th>
<th><strong>Test, exam, laboratory report</strong></th>
<th><strong>Lecture, classes, laboratory</strong></th>
<th>K1A_U28 K1A_U29</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>5</strong> Student is capable of performing a theoretical and experimental analysis of the correctness of the algorithm implemented in the tested circuit.</td>
<td><strong>Test, exam, laboratory report</strong></td>
<td><strong>Lecture, classes, laboratory</strong></td>
<td>K1A_U10 K1A_U14 K1A_U19</td>
</tr>
<tr>
<td></td>
<td><strong>6</strong> Student is able to interact and work in a group (laboratory section).</td>
<td><strong>Laboratory exercise</strong></td>
<td><strong>Laboratory</strong></td>
<td>K1A_U31 K1A_K02</td>
</tr>
</tbody>
</table>

### 18. Teaching modes and hours

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

- 30/0/0/15/0/0 (sem.1)
- 30/0/0/15/0/0 (sem.2)
- 0/0/0/0/0/30 (sem.3)
Syllabus description:

Lecture
- Information - form and processing.
- Digital circuit, digital device and digital system.
- Algebra of digital circuits.
- Functionally complete set of basic logic elements.
- Classification of digital circuits.
- Combinational functional blocks.
- Synthesis and analysis of digital combinational systems.
- Iterative circuits and their synthesis.
- Sequential functional blocks.
- Synthesis of asynchronous sequential circuits.
- Synthesis of synchronous sequential circuits.
- The dynamics of sequential circuits.
- Synthesis of digital circuits with time dependencies.
- Synthesis of microprogrammable circuits.
- Programmable logic arrays.

Classes
Auditory (table) classes present exercises based on lecture topics.

Laboratory
Laboratory include practical exercises, on real circuits and computer emulators, in the scope of: getting acquainted with the structures of elements and functional blocks, implementing independently designed digital circuits and their testing and running, analysis of circuits with respect to occurrences of phenomena caused by signal propagation, experimental study of the effects of signal propagation (hazards, races) on the correctness of the algorithms implemented by the circuits.

List of exercises:
- Elementary sequential systems.
- Asynchronous sequential circuits.
- Synchronous sequential circuits.
- Selected arithmetic systems.
- Dynamics of digital circuits.
- Registers and counters.
- Implementation of digital circuits using elements in MSI and LSI.
- Elements of computer-assisted design of digital circuits.
- Microprogrammable digital circuits.

Exam: yes (sem. 2)
### 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>60/90</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>30/30</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>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>120/150</td>
</tr>
</tbody>
</table>

**24. Total hours: 270**

**25. Numbers of ECTS: 10**

26. Number of ECTS credits allocated for contact hours: 4

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

26. Comments:

Approved:

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