1. **Course title:** DIGITAL CIRCUITS DESIGN  
2. **Course code:** DCD

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:** 3

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

11. **Course instructor:** Ph.D. Eng. Krzysztof Tokarz

12. **Course classification:** general

13. **Course status:** obligatory

14. **Language:** English

15. **Pre-requisite qualifications:** Electronics and Measurements, Digital Circuits Theory, Arithmetic of Digital Systems

16. **Course objectives:**

   The object is to present functional properties, dynamic and static digital integrated circuits and the rules for their use in construction of digital devices. It gives the basic knowledge about functioning of elements of computers and internal modules of microprocessors.

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 the general knowledge, including functional properties, dynamic and static digital circuits as well as design and construction rules of digital devices in different technologies.</td>
<td>Test</td>
<td>Lecture, classes</td>
<td>K1A_W05, K1A_W07</td>
</tr>
<tr>
<td>2</td>
<td>Student knows the basic methods, techniques and tools used to solve simple tasks from the scope of digital system design</td>
<td>Test</td>
<td>Lecture, classes</td>
<td>K1A_W22</td>
</tr>
</tbody>
</table>

¹ należy wskazać ok. 5 – 8 efektów kształcenia
18. Teaching modes and hours

Lecture / BA / MA Seminar / Class / Project / Laboratory:
30 / 0 / 0 / 15 / 0 / 0 (sem.3)

19 Syllabus description:

Lecture
Introduction, classification, purpose and area of applications of digital devices.
Basic techniques for the implementation of integrated circuits (TTL, CMOS).
Static, dynamic and functional parameters of integrated circuits.
Comparison of different implementation techniques. Input, control, processing blocks, output devices.
Integrated functional modules: 3-state buffers, multiplexers, encoders, decoders, code converters, priority coders, counters, registers, arithmetic systems, parallel transfer systems, parity bit generators, time circuits, generators, semiconductor memories, programmable PLD logic structures, displays, AD and DA converters.
Buses. Parallel asynchronous and synchronous registers and counters.
RAM memories - static SRAM and dynamic DRAM (asynchronous and synchronous). Ways to refresh the contents of DRAM memory. Building blocks of RAM with a given organization.
ROM memories, PROM, EPROM, E2PROM, FLASH. Construction of fixed memory blocks with a given organization.
Programmable logical PLD structures. Programming of permanent memories and PLD systems.
Digital signal transmission. Transmission lines, asymmetrical and symmetrical, line transmitters and receivers.
Input systems: buttons, keyboards. Output systems, seven-segment displays, LCD, numeric, alphanumeric, matrix, LED matrix displays.
Disturbances in digital circuits (external, internal: crosstalk, reflections) and ways of limiting their impact (shielding, blocking, wave fitting).
Launching of digital circuits. Logic analyzers, signature analyzers.
Classes
During the classes the examples of designing typical systems are presented with the necessary calculations related to, for example, the selection of resistor values for OC type outputs or counting the current limit of outputs.

20. Exam: no

21. Primary sources:

22. Secondary sources:
   2. J. Pieńkowski, J. Turczyński „Układ scalone TTL w systemach cyfrowych” WKiŁ, 1980r..

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>30/20</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>15/15</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>/</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>5/5</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>50/40</td>
</tr>
</tbody>
</table>

24. Total hours: 90

25. Numbers of ECTS: 3

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

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): none

26. Comments:

Approved:

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