DESCRIPTION OF THE COURSES

- Course code: ARR2114
- Course title: THEORY OF AUTOMATA
- Language of the lecturer: Polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*2*		*1*		
*Number of hours/semester**	*30*		*15*		
Form of the course completion	*pass*		*pass*		
ECTS credits					
Total Student's Workload					

- Level of the course (basic/advanced): basic
- Prerequisites:
  completed course: Fundamentals of Electronics.
- Name, first name and degree of the lecturer/supervisor:
  Jan Iżykowski, Ph. D., D. Sc.
- Names, first names and degrees of the team's members:
  Eugeniusz Rosołowski, Prof., Ph. D., D. Sc.
  Janusz Staszewski, Ph. D.
  Mirosław Łukowicz, Ph. D.
- Year: 5 Semester: 9
- Type of the course (obligatory/optional): optional
- Aims of the course (effects of the course):
  Gain of basic knowledge with respect to combinatorial and sequential logic circuits (automata). In particular, to be familiar with: - presenting the required operation of the logic circuit, - synthesis (design) and analysis of automata, - implementation issues. Relating both synthesis and analysis of the considered automata to practical cases of the automata application enables getting relevant skills for self-designing of the automata.
- Form of the teaching (traditional/e-learning): traditional
- Course description:
  The course consists of the lecture and laboratory, which deal with the following problems. Boolean algebra and logic expressions. Methods of analysis and synthesis of combinatorial and sequential logic circuits. Combinatorial logic circuits - simplification, designing and troubleshooting. Sequential automata: description and classification. Structure of Moore and Mealy sequential automata. Design of sequential automata with the method of consecutive switching tables. Design of sequential automata with use of transition tables and output maps. Implementation of automata. Examples of the automata synthesis.
- Lecture:

Particular lectures contents	*Number of hours*

1. *Introduction, classification of circuits. Boolean algebra, logic expressions and laws. Logic gates and circuits.*	*2*
2. *Canonical forms of logic functions and their simplification rules.*	*2*
3. *Design of combinatorial logic circuits – Karnaugh map method.*	*2*
4. *Quine-McCluskey algorithm for designing combinatorial logic circuits.*	*2*
5. *Sequential automata – division basic characteristic, methods of the automata memory function realization.*	*2*
6. *Design of asynchronous automata with the method of consecutive switching tables.*	*2*
7. *Design examples of asynchronous automata with the method of consecutive switching tables when the initial table is unrealisable.*	*2*
8. *Moore and Mealy type automata. Automata description – time graphs, transition tables and output maps, graphs.*	*2*
9. *Design principles of Moore and Mealy type automata with use of transition tables and output maps.*	*2*
10. *Design examples of Moore and Mealy type automata with use of transition tables and output maps.*	*2*
11. *Phenomena of troubleshooting (hazards) and races in sequential systems.*	*2*
12. *Application of flip-flops to memory functions in asynchronous sequential circuits.*	*2*
13. *Design of synchronous sequential circuits.*	*2*
14. *Typical logic circuits and systems, selected design examples.*	*2*
15. *Pass test.*	*2*

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
  1. Design of asynchronous sequential logic circuits with use of the transition tables and output maps.
  2. Design of asynchronous sequential automata with flip-flops applied for memory realisation.
  3. Design of asynchronous sequential automata with the method of consecutive switching tables.
  4. Multiplexers, demultiplexers and code conversion circuits.
  5. Design of synchronous sequential automata.
  6. Adders, subtractors, comparators, counters and memory registers.
- Project – the contents:
- Basic literature:

[1] Mano M. Morris, Digital design (second edition), Prentice-Hall Int., Inc., Englewood Cliffs, New Jersey, 1991.

[2] M. Morris Mano, C. R. Kime: Logic and computer design fundamentals, Pearson Prentice-hall Int., 2004, 3rd ed.

[3] Tocci R.J., Digital Systems. Principles and applications, Prentice-Hall Int., Inc., London, 1988.

- Additional literature:

[1] Układy logiczne. Ćwiczenia laboratoryjne. Skrypt Politechniki Wrocławskiej pod red. Mirosława Łukowicza. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2002.

[2] Wilkinson B., Układy cyfrowe. WKŁ, Warszawa, 2000.

[3] Skorupski A., Podstawy techniki cyfrowej. WKŁ, Warszawa, 2001.

[4] Kamionka-Mikuła H., Małysiak H., Pochopień B., Układy cyfrowe. Teoria i przykłady. Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego. Wydanie III poszerzone. Gliwice 2001.

[5] Majewski W., Układy logiczne. WNT, Warszawa, 1993.

- Conditions of the course acceptance/credition:

* - depending on a system of studies