

## **SYLLABUS**

**SUBJECT:** DIGITAL TECHNIQUES

**TEACHER:** Prof. UR BOHDAN RYTSAR, PhD, DSc, Eng., MARIUSZ WOŹNY, MSc

### **COURSE DESCRIPTION:**

The course objective is to acquaint the students with the fundamentals (principles and applications) of digital techniques (electronics and engineering) in particular mathematical essential of the modern design on logical synthesis level of digital circuits and systems.

### **LECTURE:**

The mathematical fundamentals of digital systems: number systems and codes (binary numbers and arithmetic, conversions between of systems, BCD, Gray code, ASCII code), rules and laws of Boolean algebra, logic (Boolean) functions (expressions) and their representations, logic gates, minimization methods of Boolean functions (by K-maps, Quine-McCluskey, conjuncterms, splitting), functional decomposition; combinational logic (de/coders, de/multiplexers, adders, ALU, PLD (PLA, PAL, FPGA), sequential logic (flip-flops, registers, counters, memories); modern digital design on the logic synthesis level on the basis minimization (programs ESPRESSO, SPLIT) and decomposition of Boolean functions and their systems (programs Quartus, BRASh).

### **CLASSES:**

Practical exercises concerning digital circuits (logic gates, combinational and sequential devices) by Softronic program MultiMedia Logic Version 1.4 and logic synthesis of digital systems by programs SPLIT (for minimization) and BRASh (for decomposition).

### **LEARNING OUTCOMES:**

Students will receive a basic knowledge about fundamentals of digital techniques and modern design on logical synthesis level of digital circuits and systems.

### **GRADING POLICY:**

**LECTURE:** Written test.

**CLASSES:** Two written tests and short questions before classes.

### **TIMETABLE:**

**LECTURE:** 2 hours/every two weeks

**CLASSES:** 2 hours/every two weeks

### **TEXTBOOK AND REQUIRED MATERIALS:**

1. Barry Wilkinson, The Essence of Digital Design, Prentice Hall, London/.../Munich, 2004 (in Polish).
2. Parag K. Lala, Principles of Modern Digital Design, PWN, Wiley Inc., 2007.
3. Sajjan G. Shjiva, Introduction to Logic Design, Marcel Dekker, Inc., 1998.

### **PREREQUISITES:**

Mathematics and physics in comprehensive school.