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| **Programming and Digital techniques II.** |

**Code: MFDIG31R03-EN**

**ECTS Credit Points: 3**

**Evaluation: mid-semester grade**

Year, Semester: 3rd year/1st

Number of teaching hours/week:

Lecture: **2**

Practice: **4**

**Prerequisites: MFDIG01R02-EN.**

**Topics**:

Introduction to FPGA programming and digital techniques. Introduction to Xilinx ISE programming environment, VHDL programming language and their typical properties. Programming in practice: logic gates, multiplexers, demultiplexers, counters, final state machines.

**Schedule**

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| **1st week:****Lecture:****Practice:** Preparation, Course-up, description of subject requirements, course schedule description, description of the course literature list**2nd week:** **Lecture:** The basics of Boolean algebra, postulates and theorems of Boolean algebra, Boolean functions**Practice:** Knowledge of digital circuits, measurement parameters**3rd week:** **Lecture:** TheBinary number system, arithmetic operations with binary numbers, negative numbers representation**Practice:** Designing circuits using SSI(AND, OR, NOT gates)**4th week:****Lecture:** Numerical codes, logic families, logic gates, Boolean operators**Practice:** Design circuits using SSI (AND, OR, NOT gates)**5th week:****Lecture:** The TTL circuit family, CMOS technology, ECL Circuit Family**Practice:** Design circuits using MSI (multiplexers, demultiplexers) | **6th week:****Lecture:** Theory of combination circuits, circuit design, SSI, MSI circuit design, digital circuit design LSI, ROM memory, RAM memory**Practice:** Design using MSI circuits (decoders, multiplexers)**7th week:** **Lecture:** Extension of memory size of the programmable logic matrix, FPGA circuits**Practice:** Designing using LSI circuits **8th week:****Lecture:** FPGA circuits, Tipper circuits, registers circuits, Counting circuits**Practice:** Using counter and register circuits**9th week:****Lecture: Mid-term test****Practice:****10th week:****Lecture:** Sequential circuits, asynchronous sequential circuits design, synchronous sequential circuit design**Practice:** Construction of synchronous and asynchronous sequential circuits |
| **11th week:****Lecture:** Microcontrollers**Practice:** Microcontroller programming in Assembly language**12th week:****Lecture:** Design a generative system with PIC 16F877microcontroller**Practice:** Controlling a stepper motor using PIC 16F877 microcontroller | **13th week:****Lecture:** Microprocessors**Practice:** Microcontroller programming in Assembly language**14th week:****Lecture:** Programming a Data Processing Card**Practice:** Microcontroller programming in Assembly language**15th week:****End-term task** |

**Requirements**

**A, for a signature:**

Attendance at **lectures** is compulsory.

**B, for a mid semester-grade:**

Students have to fulfil a mid-term exercise at least for 50% to take part in the next lectures. All students, who failed the mid-term exercise will not get a mid-semester grade. At the end of the semester, all the students have to solve a real life problem in programming. Also a task, to make a complete documentation of a project file, using all the methods, mentioned during the session.

The course ends in a **mid-semester grade (AW5)**. Based on the average of the marks of the tasks.