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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.