Assessment and subject description

Óbuda University Kandó Kálmán Faculty of Electrical Engineering		Institute of Microelectronics and Technology		
Subject name and code: **Digital Technics II KAXDT6ABNE** Full-time, Spring Semester 2019/2020			**Credits: 4**	
Course: BSc in Electrical Engineering				
Responsible:	Dr. Semperger Sándor, PhD, associate professor	Teaching staff:	Dr. Bálint Pődör, CSc (honorary) full professor Dr. Kovács Balázs, CSc, associate professor	
Prerequisites:		Digital technics I		
Contact hours per week:	Lecture: **2**	Class discussion: **0**	Lab hours:**20**	Tutorial: **0**
Assessment and evaluation:	**exam**			

<table>
<tr><td colspan="3" align="center">Subject description</td></tr>
<tr><td colspan="3">Aims:
This course will give an overview of the basic concepts and applications of digital technics, from Boolean algebra to microprocessors. The aim is to acquaint the future electrical engineers with the fundamentals of digital technics, with the digital circuits, and with their characteristics and applications. In the course of two-semester lectures and laboratory exercises the future electrical engineer should acquire solid knowledge and sufficient proficiency in the functioning, operation, design and applications of digital systems.</td></tr>
<tr><td colspan="3">Topics to be covered:
Sequential circuits, general concepts and properties, synchronous and asynchronous operation. elementary sequential circuits, flip-flops. Analysis and synthesis of sequential circuits. Sequential functional blocks, registers, counters. Logic circuit generations and families, general properties. Implementation technologies, bipolar (TTL, ECL), FET (CMOS). Programmable logic devices. Arithmetic circuits, combinational and sequential. Semiconductor memories, properties, addressing. Microprocessor basics, arithmetic logic units, datapaths, interfaces, interrupt.</td></tr>
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Lecture topics	Week	Lessons
Sequential logic circuits introductory review. Asynchronous and synchronous circuits especially counters, and registers, construction and operation.	**1**	**2**
Sequential functional blocks, counters, registers, register based counters.	**2**	**2**
Analysis and synthesis of sequential circuits based on next state table and state transition diagram. 4-bit parity checker, 4-bit Gray code counter, traffic signal light controller.	**3**	**2**
Logic circuits I. Basic principles (logic families, inverter). MOS circuits. CMOS logic, principles, CMOS technology. Basic CMOS gates, pass transistor logic.	**4**	**2**
Logic circuits II. Logic circuit generation and families. Bipolar and TTL. Schottky technology.	**5**	**2**
Logic circuits III. BiCMOS circuits, ECL circuits. General comparison and evaluation of different logic circuits and technologies..	**6**	**2**
Implementation of combinational circuits. Static and dynamic characteristics, loading, delays, hazards.	**7**	**2**
Arithmetic circuits. Carry-look ahead and carry select adders, parallel multipliers. Series arithmetic circuits: adders and multipliers. Arithmetic logic unit: structure and properties.	**8**	**2**
Semiconductor memories. Classification, technologies, properties and applications.	**9**	**2**
Programmable logic devices, PAL, PLA, FPGA, basics, technology, operation. Program description languages (Verilog, VHDL).	**10**	**2**
Microprocessors basics. Elementary concepts, structure, bus system, operation, handling of peripheries, interruption system.	**11**	**2**
Microcomputers basics. Memories, arithmetic and logic units, analog and digital in- and output peripheries.	**12**	**2**

	Week	Hours
Bipolar and MOS switches, digital-analog and analog-digital converters.	13	2
End-of-term review.	14	2
Laboratory practice subjects	**Week**	**Hours**
Analysis of combinational circuits.	2	4
Analysis of arithmetic circuits.	4	4
Analysis of flip-flops and registers.	6	4
Analysis of frequency dividers and counters.	8	4
Synthesis and implementation of counters.	10	4
Synthesis and implementation of 3-bit arithmetic logic unit.	12	4
Supplementary practice.	14	4

Assessment and evaluation

Requirements of the signature:

The attendance of the lectures and laboratory practices is compulsory. Students who did not complete all laboratories during the term are not admitted to examination. Students whose absence from lectures exceeds the limits stipulated in the Rules and Regulations of the University cannot be admitted to examination.

The coursework comprises several home assignments and a written mid-term test. The home assignments should be submitted in a form of technical report (hard copy on A4 sheets or electronic file) on the deadlines set. The condition for admission to examination, besides the above rules concerning lecture attendance and completion all laboratory practices, is the submission of all home assignments and at least a *pass* mark (2) in the mid-term test.

Type of exam:

Written and supplementary oral examination at the end of the semester.

The threshold for pass mark (including the results of home assignments and mid-semester test) is 55 %.

Evaluation of the exam:

The results of home assignments and of the test will be appropriately incorporated in the final grade. Weighing (app.): home assignments results 30 %, mid-term test result 10%, and exam paper 60 %.

Suggested material

Any good recent English language textbook.

Bálint Pődör: *Digital technics II* lecture files (updated), University E-learning (Moodle) system, earlier version available also from the homepage of the Microelectronics and Technology Institute, *mti.kvk.uni-obuda.hu*

Bálint Pődör: *Digital technics* (course materials for final year elective English language course), available from the homepage of the Microelectronics and Technology Institute, *mti.kvk.uni-obuda.hu*

Comment: