Obuda University John von Neumann Faculty of Informatics		Institute for Cyber-physical Systems		
Name and Code: NIXDR0HBNE Digital Systems			**Credits*: 4***	
Computer Engineering BSc		*Full-time course 2022/23 year I. semester*		
Subject lecturer(s): Dr. Komoróczki – Steiner Henriette, Somlyai László, Fekete György, Zakár István				
Prerequisites (with code):				
Weekly hours:	Lecture:2	Seminar: 0	Laboratory 2	Consultation: 0
Way of assessment (exam or midterm grade):	Midterm grade			

Course description:

Goal: The aim of the course is to familiarize students with the basic knowledge of digital electronics required for a technical computer scientist, the most important building blocks of digital systems, the development trends of logic circuit families, the application issues of logic circuit families and the building blocks that can be used for the programmed implementation of complex functions. In the course of the course, students will learn about the theoretical operation of digital systems (logic networks), the basic methods of their description, the operation of logic networks through examples, insights into the design of logic networks, and computer simulation methods through problem solving and demonstrations. The aim of the course is to familiarise students with the basic knowledge of digital electronics required by computer engineers, the most important building blocks of digital systems, trends in the development of logic families, and the application of logic families and building blocks for the programmed implementation of complex functions.

Course description: The concept and principle of a logic network, its basic types and description possibilities. Basics of Boolean algebra. Universal logic functions and their building blocks. Design and analysis of combinational networks. Basics of systematic design methods, basic tools and main methods of investigation. Ideal and real building blocks, characteristics of real building blocks. Programmable combinatorial networks. Basic types of sequential networks, their description methods, building blocks. Basic models of synchronous and asynchronous networks. Design and analysis of synchronous networks. Applications of programmable networks, main tools and methods of investigation. Typical synchronous networks. Basics of design and testing of asynchronous networks. Design and simulation of single and multi-output logic circuits using electronic CAD software. Design, implementation, testing and documentation of complex digital circuits using FPGA circuits. Production of downloadable files, online download, testing, debugging, debugging, documentation. Switching mode of transistors, General characteristics of logic circuits, Basic circuits of major logic families, Applications of logic families, Simulation studies of logic families, Signal generating and shaping circuits, Storage circuits, Storage cells, Noise and noise problems in digital systems, Basic concepts of integrated circuit manufacturing.

Lecture schedule	
Education week	Topics
1.	Basics of Boolean algebra
2.	Description methods for combinatorial networks
3.	Ideal and real building blocks, characteristics of real building blocks
4.	Sequence networks
5	Design and analysis of synchronous networks
6.	Typical synchronous networks
7.	The finite state machine: CPU
8.	Application of logic families: the diode
9.	General characteristics of logic circuits: the transistor

10.	Computer design simulation
11.	Online test
12.	Midterm exam + lab test
13.	Complementary midterm exam + complementary lab test
14.	Presentation of application tasks
Midterm requirements	

The subject is divided into weekly lessons in the framework of E - learning. In the case of the theoretical material, each week contains 1 to 4 sub-chapters per lesson in the form of videos. These units are accompanied by a short self-assessment test, which can be completed in any number of units. The purpose of this division is to enable students to progress through one lesson per day in small units. A longer self-assessment test and a written version of the theoretical material are provided at the end of the week. This material includes control theory questions and exercises, which you will be asked to solve orally and in writing.

Each week the exercises will be accompanied by theoretical and practical material and a video related to the specific subject, measurement or simulation task. They are also followed by a set of related self-checking questions.

During the semester, the semester performance of the students is determined on the basis of the small Exams written in the practicals, online Test, the theoretical and practical big Exams. Completion of all the assignments in the lab practicals is compulsory, all the assignment sheets of these must be submitted in full.

In order to complete the semester, the aggregate score of the small Exams written in the practical labs, the practical big EXAM, the theoretical big EXAM, must be at least satisfactory level, i.e. separately, 60%, and the online test must be at least 80% and the aggregate laboratory performance (all lab assignments must be complete) must be acceptable.

Classroom worksheets:
During the first 10 weeks, each student is required to prepare a written (handwritten) assignment sheet (record) of the given class assignments, the completed assignment sheet must be submitted and uploaded to the moodle platform. The Task Sheets should include the following: measurement task formulation, wiring diagrams, measurement/simulation plan, measurement results and finally the measurement evaluation.

Small EXAM:
More small EXAMs will be written during the semester. The small EXAMs are written by all students at the same time, either during the theory class or during the practical class. Exams not written will be credited with 0% marks. One small EXAM can be made up once during the semester (week 11). If the average of the small Exams, including the make-up, does not reach 60%, a signature make-up exam must be taken at the time scheduled during the exam period. IMPORTANT: the practical small EXAM includes both the theoretical and practical material taken in the previous lessons and the material for the current lesson.

Online test
During the semester, in week 11, a test of 50 questions will be completed on Moodle.
The test can be completed 2 times and the better result will be considered. If the test score is less than 80%, the student is not eligible to take the major EXAM and must take a substitute exam

Lab mid -term exam:
The lab major EXAM will be written in week 12 during the lab practical. Here, students will be required to independently solve a lab problem based on what they have learned during the semester. The EXAM can be made up once during the semester in week 13, if the result of this or the make-up does not reach 60%, a signature make-up exam must be taken at the time scheduled during the exam period (the result of the last written EXAM counts).

Lecture major final examination:
In week 12, the lecture major EXAM will be written during the theory class, which can be corrected once during the semester in week 13 (regardless of the student's lab assignment). If the result of this or the correction does not reach 60%, a signature make-up exam must be taken at the time of the exam (the result of the last written EXAM counts).

In order to obtain a mid-term mark, the cumulative score of the practical small EXAMs, the practical large EXAM, the theoretical large EXAM, must be at least satisfactory level, i.e. separately 60%, and the online test 80% and the cumulative laboratory performance (all laboratory tasks must be complete in written form) must be acceptable.

A student who is absent from more than 30% of the lab assignments (TVSZ) will be disqualified from the course. The student must be prepared for the lab exercises according to the measurement aids provided, otherwise the student will not be allowed to participate in the lab exercise, which will be considered as an unexcused absence

Midterm Examination

WEEK	Témakör
11.	Online test (min 80% need) - Test can be completed twice+ Complementary small EXAM (if needed)
12.	midterm exam + lab test
13.	Complementary midterm exam + complementary lab test
14.	

Method used to determine the end-of-semester grade

All results (Small Exams, Large Exams, Online Test) are expressed as a percentage.

Method of calculation of the mark (if all other conditions are met):

MARK = (Lab EXAM % + Theoretical major EXAM %) / 2 [%]
(each of the two EXAMs separately must achieve 60%)

Point thresholds for each merit mark:

0% - 59%: unsatisfactory (1)
60% - 69%: satisfactory (2)
70% - 79%: average (3)
80% - 89%: good (4)
90% - 100%: excellent (5)

Complementary exam

During the semester 1 small EXAM can be substituted in week 12.

Two large EXAMs (laboratory written large EXAM and theoretical large EXAM) required to obtain a mid-term grade can be substituted in week 14.

All parts must be made up in the signature make-up exam:
- Presentation of completed worksheets from class (from material from weeks 1 to 10).
- Small EXAM questions
- Lab large EXAM
- Theoretical large EXAM

Exam
The subject ends with a mid-year mark. Small Exams are written in the theory class or in the practical class. The test written in week 11 is online: on Moodle. The large theoretical EXAM written in week 13. The large practical EXAM written in week 13 is a complex development of a measurement or simulation task during the practical in week 13.
Grade
The subject ends with a mid-term grade.
Referencies
Obligatory:
Learning materials in Moodle
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