Assessment and subject description

Óbuda University Kandó Kálmán Faculty of Electrical Engineering			Institute of Microelectronics and Technology	
Subject name and code**: Analogue and Digital Technics KMEDT1AMND Credits: 5** **Full-time, Spring Semester**				
Course: Technical Management				
Responsible:	Dr. Balázs Kovács	Teaching staff:	Márk Horváth	
Prerequisites:	Electrotechnics, KMEEL1AMND			
Contact hours per week:	Lecture: 2	Class discussion: 2	Lab hours: 0	Tutorial:
Assessment and evaluation:	Exam			

Subject description

Aims: The subject's aim is to understand the basic properties and applications of basic semiconductor devices and circuits such as diodes, transistors and operational amplifiers.
This course will give an overview of the basic concepts and applications of digital technics. In the course of lectures, classroom-tutorials and laboratory exercises the future technical management should acquire solid knowledge and sufficient proficiency in the functioning, operation, design and applications of digital systems.

Topics to be covered: P-N junction, diodes. Bipolar transistors. Field-effect transistors. Fundamentals of digital technics. Logic (Boolean) algebra, logic operations and functions. Combinational logic, analysis and synthesis and implementation of logic circuits. Binary arithmetics, algorithms and circuits. Code systems, code conversion. Combinational circuit functional building blocks, properties and applications.

Topics	Week	Lessons
Overview of systems: transfer function, linearity, causality, time dependancy, spectral response. Concept of analogue and digital systems. Overview and repetition of electricity theory concepts.	1.	2+2
Semiconductors. Intrinsic and doped semiconductors, n and p type crystal structures. Majority and minority charge carriers. Conductivity in semiconductors, drift and diffusion currrent. p-n junction, space charge region, diffusion potential. Behavior of p-n junction due to external bias.	2.	2+2
Application of semiconductor diodes. The semiconductor diode. Thermal dependence and capacity of p-n junction. Concept of operating point, static and dynamic resistance.	3.	2+2
Bipolar transistor. Structure, properties, characteristics and function of bipolar transistors. Setting of operating point, thermal dependence.	4.	2+2
Amplification with bipolar transistor. Physical process of amplification. Basic amp. circuits. Parameters of amplifiers. Switching mode.	5.	2+2
MOS-FET. Structure and operation of MOS-FETs. Characteristics. Switching mode. CMOS circuits.	6.	2+2
Official break	7.	2+2
Test1	8.	2+2

Fundamental concepts of digital technics and of logic networks. Specific characteristics of digital technics. Digital (binary) representation. Number systems, fundamentals. Binary numbers. Arithmetic operations in the binary number systems. Codes and encoding, fundamental concepts. Numeric and alphanumeric codes. Pure binary codes (direct, 1s complement, 2s complement codes. Arithmetic operations in 1s and 2s complement codes. Tetrad codes, BCD codes. Arithmetic operations in tetrad and BCD codes	9.	2+2
Introduction to and applications of logic algebra. Description of logic connection: textual, algebraic form, truth table, logic diagram. Boolean algebra: axioms and theorems. Fundamental logic operations.	10.	
Logic functions, fundamental concepts. Two-variable logic functions. Fully and incompletely specified logic functions. Canonic forms of logic functions. Disjunctive (sum-of-products, SOP), conjunctive (product-of-sum, POS) canonic forms, minterms and maxterms.	11.	2+2
Manipulation and transformation of logic functions. Graphic representation: Veitch diagrams and Karnaugh maps). The concept and methods of logic function minimization.	12.	
Sampling and quantization. Sampling theorem, aliases. Digital information transmission. Bit rates, SNR, error correction methods. Compression. Encryption.	13.	2+2
Test2	14.	2+2

Assessment and evaluation
Requirements of the signature:
To attend the lectures and class discussion is obligatory. Above that it is required to pass two tests.

Type of exam:
Written and oral

Evaluation of the exam:
To pass the exam to reach at least 50% is required.

Suggested material

Rita Lovassy: Digital Technics http://uni-obuda.hu/users/lovassyr/Lovassy_Digital_technics.pdf
Bálint Pődör: Digital technics I (course materials for 1st year English language course), mti.kvk.uni-obuda.hu
Bálint Pődör: Digital technics (course materials for final year elective English language course), mti.kvk.uni-obuda.hu
Arató Péter: Logikai rendszerek tervezése, Tankönyv kiadó, Budapest, 1990, Műegyetemi Kiadó 2004
Zsom Gyula: Elektronikus áramkörök I.A Bp. 1991. KKMF 1040
Molnár Ferenc – Zsom Gyula: Elektronikus áramkörök II.A I. – II. kötet Bp. 1991. KKMF 1044