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:	Balázs Kovács, Ph.D.	Teaching staff:	Márk Horváth András Mészáros	
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
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.	1.	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.	2.	2+2
Bipolar transistor. Structure, properties, characteristics and function of bipolar transistors. Setting of operating point, thermal dependence.	3.	2+2
Amplification with bipolar transistor. Physical process of amplification. CE, CC, CB basic circuits. Parameters of amplifiers.	4.	2+2
MOS-FET. Structure and operation of MOS-FETs. Enhancement and depletion MOS-FET. Characteristics. CMOS circuits.	5.	2+2
J-FET. Structure and operation of J-FET. Characteristics. Setting of operating point; thermal dependance. Basic 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.	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.	
Number systems, fundamentals. Binary numbers. Arithmetic operations in the binary number systems.	13.	2+2
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 **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

Comment:
The lecture's materials are the basics of the learning process. They could be found on the concerned web sites of the university.