SYLLABUS

1. Information about the study program

1.1 Higher education institution	Babeș-Bolyai University
1.2 Faculty	Mathematics and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computers and Information Technology
1.5 Study cycle	Bachelor
1.6 Study program / Qualification	Information Engineering

2. Information about the course

2.1 Title of the course		Digital electronics					
2.2 Teacher in charge of the lecture			Dr. ThuHang Bui				
2.3 Teacher in charge of the seminar			Dr. ThuHang Bui				
2.4 Study year	2	2.5 Semester	4	2.6. Examination type	E	2.7 Course type	Compulsory DD

3. Estimated total time (number of hours of teaching activities per semester)

3.1 Number of hours per week	6	out of which: 3.2 lecture	3	3.3 seminar / laboratory	2 LP 1 P
3.4 Total number of hours in the curriculum	84	out of which: 3.5 lecture	42	3.6 seminar / laboratory	42
Distribution of the allocated amount of time:					hours

Individual study (textbook, course support, bibliography, and notes)	14
Supplementary documentation at the library using specialized electronic platforms in the field	
Preparing for seminars / laboratories, homework, papers, portfolios, and essays	
Tutoring	
Evaluations	2
Other activities: research activities	

3.7 Total number of hours of individual study	16
3.8 Total number of hours per semester	100
3.9 Number of credits (ECTS)	4

4. Prerequisites (if applicable)

4.1 Curriculum	- Basic knowledge of boolean algebra
4.2 Competencies	- Familiarity with logical algebra - Analytical thinking

5. Requirements (if applicable)

5.1 For the lecture	• Classroom with at least 100 seats, computer and video projector / Online course conducted through the MS Teams platform. • Also equipped with blackboard and beamer
5.2 For the seminar / laboratory	• Room with at least 30 seats, computer and video projector / Online seminar conducted through the MS Teams platform. • Also equipped with blackboard and beamer

6. Specific skills acquired

Professional skills	**Knowledge and understanding** • C2.1 Describing the structure and operation of hardware, software and communication components • C2.2 Explaining the role, interaction and operation of hardware, software and communication components • C5.1 Appropriate use of the operating principles of electronic devices and circuits, as well as methods of measuring electrical quantities • C5.2 Analysing, designing, executing and measuring of electronic circuits of low/ medium complexity
Transversal skills	• CT1 Honorable, responsible, ethical behavior, in the spirit of the law, to ensure the professional reputation • CT3 Demonstrating initiative and pro-active behavior for updating professional, economical and organizational culture knowledge

7. Objectives of the course (based on the grid of acquired competencies)

7.1 General objective	• Understand operation, application of TTL and CMOS electronic logic devices, • Understand how to use combinatorial and sequential logic circuits, the interface between the logic families, and the interface between digital and analog circuits. • The course also provides a study of Boolean algebra, binary and hexadecimal number systems, binary codes, and the analysis of the basic components and circuits used in semiconductor switching

7.2 Specific objectives	• Identify analog and digital electrical signals. • Convert numbers between decimal, binary, octal, and hexadecimal number systems. • Explain the operation of digital logic gates. • Use Boolean algebra to express logic operations as equations. • Use Karnaugh maps to minimize (simplify) Boolean equations. • Identify combinatorial logic circuits and sequential logic circuits, and explain their operation. • Identify, explain, and implement various types of flip-flops, counter circuits, shift registers, and other logic circuits. • Identify com m only used integrated circuit families used in digital equipment. • Explain the principles of analog-to-digital (AD) - and digital-to-analog (DA) conversion, • Troubleshoot digital circuits using standard test equipment and specialized instruments.

8. Content

8.1 Lecture	Teaching strategies	Remarks

I Introduction digital electronics **(Lect 1-2)** 1. Number Systems and Codes 2. Digital electronic signal and switches 3. Basic Logic gates (AND, OR, NOT, NAND and NOR) II Combinatorial Logic **(Lect 3-5)** 1. Boolean Algebra and Reduction Techniques 2. Exclusive OR and Exclusive-NOR Gates 3. Arithmetic Operations and Circuits (Half Adder and full Adder) 4. Data Control Structures (Code converter and Multiplexers and Demultiplexers) III Logic Design; Flip-Flops **(Lect 6-8)** 1. Logic Families 2. Flip-Flops and Registers (S-R Flip-Flop, D Flip-Flop, and J-K Flip-Flop) IV Sequential logic, Timer **(Lect 9-10)** 1. Counter Circuits (Asynchronous and synchronous Counters) 2. Shift Registers (Serial/Parallel Data Conversions and specialized Counter Circuits) 3. Multi-vibrators and Timers (Astable, Monostable, Schmitt Trigger) V real-world Interfacing **(Lect 11-14)** 1. Analog-to-Digital 2. Digital-to-Analog	Exposure: description, explanation, examples, discussion of case studies	

3. Signals and Signal Conditioning		

Mandatory references:

1. John F. Wakerly (2006), Digital design Principles and Practices, 4th, Prentice Hall
2. Kleitz, W. (2012) Digital Electronics: A Practical Approach with VHDL, 9th Edition. Upper Saddle River, NJ: Pearson Education, Inc. ISBN-13: 9780132435789
3. Kleitz, W. (2008) Laboratory Manual to Accompany Digital Electronics, 8th Edition. Upper Saddle River, NJ: Pearson Education, Inc. ISBN-13: 9780132239820
4. Nigel P. Cook (1998), Introductory Digital Electronics, Prentice.
5. Tocci and Widmer (1998) Digital Systems – Principles and applications, Prentice Hall.

Optional references:

1. Floyd, Thomas. Digital Fundamentals. 8th ed.
2. Dueck, Robert. Digital Design with CPLD Application and VHDL
3. Neil H.E. Weste, David M. Harris, (2011) 4th , CMOS VLSI Design: A circuites and Systems Perspective, Addison-Wesley

8.2 Seminar / laboratory	Teaching strategies	Remarks
Logic Gate	Explanation, dialogue, debate, group work	4 hours
Number Systems and Codes	Explanation, dialogue, debate, group work	4 hours
Digital Circuit	Explanation, dialogue, debate, group work	4 hours
Combinational logic design principles	Explanation, dialogue, debate, group work	4 hours

Feedback circuits and sequential logic design	Explanation, dialogue, debate, group work	4 hours
Digital Integrated Circuits and Interface Design	Explanation, dialogue, debate, group work	6 hours

Mandatory references:

1. John F. Wakerly (2006), Digital design Principles and Practices, 4th, Prentice Hall
2. Kleitz, W. (2012) Digital Electronics: A Practical Approach with VHDL, 9th Edition. Upper Saddle River, NJ: Pearson Education, Inc. ISBN-13: 9780132435789
3. Kleitz, W. (2008) Laboratory Manual to Accompany Digital Electronics, 8th Edition. Upper Saddle River, NJ: Pearson Education, Inc. ISBN-13: 9780132239820

Optional references:

4. Neil H.E. Weste, David M. Harris, (2011) 4th , CMOS VLSI Design: A circuites and Systems Perspective, Addison-Wesley

8.3 Project	Teaching strategies	Remarks
1. Project themes presentation. Picking a project theme.	Explanation, dialogue, debate, group work	
2. Project specification	Explanation, dialogue, debate, group work	
3-4. Project implementation	Explanation, dialogue, debate, group work	

5-6. Testing, documentation.	Explanation, dialogue, debate, group work	
7. Evaluation	Explanation, dialogue, debate, group work	

9. Correlations between the content of the course and the expectations of the representatives of the epistemic community, professional associations and representative employers in the field related to the program

The proposed lecture and seminar offer central topics in fundamental and applied research in the field, and their approach is based on the most recent results found in the literature. The course also offers state of the art research skills that are transferable to any scientific and applied field of knowledge.

10. Evaluation

Activity type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final grade
10.4 Lecture	- know the operation, mathematic of logic gate, combinational logic, feedback, sequential circuits; - understand and know how to analyze, design circuits	Written exam	60%

10.5 Seminar / laboratory	- be able to implement, design, troubleshoot circuit and real-world interface	Project	40%
10.6 Minimum passing score			
The final grade consists of: a. score obtained in the written exam in proportion of 60% b. project 40%			

Date 12.05.2022

Signature of the teacher in charge of the lecture.

Dr. ThuHang Bui

Signature of the teacher in charge of the seminar.

Dr. ThuHang Bui

Approval date in the department

24.05.2022

Signature of the Head of the department /director