SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Computer science/ Engineer
1.7 Form of education	Full time
1.8 Subject code	4.

2. Data about the subject

2.1 Subject name	***Logic Design***				
2.2 Course responsible/lecturer	Prof. dr. eng. Octavian Creţ – Octavian.Cret@cs.utcluj.ro				
2.3 Teachers in charge of seminars/ laboratory/ project	Drd. ing. Diana Pop – Diana.Pop@cs.utcluj.ro ing. Noema Maier – noema_mnl@yahoo.com ing. Bogdan Vlad Zirbo – bogdanvladutzirbo@gmail.com				
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	E
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*				DD
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminars		Laboratory	2	Project	
3.2 Number of hours per semester	56	of which:	Course	28	Seminars		Laboratory	28	Project	
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										25
(b) Supplementary study in the library, online and in the field										17
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										17
(d) Tutoring										6
(e) Exams and tests										9
(f) Other activities:										0
3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))										69
3.5 Total hours per semester (3.2+3.4)										125
3.6 Number of credit points										5

4. Pre-requisites (where appropriate)

4.1 Curriculum	• N/A
4.2 Competence	• Mathematics (Algebra), Physics (electricity)

5. Requirements (where appropriate)

5.1. For the course	A minimum of 80% course attendance rate is mandatory for being admitted to the final exam.
5.2. For the applications	Preliminary preparation of summaries from the indicated bibliography (laboratory textbook)

6. Specific competence

6.1 Professional competences	**C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts **C1.1 –** Recognizing and describing concepts that are specific to the fields of calculability, complexity, programming paradigms, and modeling computational and communication systems

	C1.2 – Using specific theories and tools (algorithms, schemes, models, protocols, etc.) for explaining the structure and the functioning of hardware, software and communication systems **C1.3 –** Building models for various components of computing systems **C1.4 –** Formal evaluation of the functional and non-functional characteristics of computing systems **C1.5 –** Providing a theoretical background for the characteristics of the designed systems
6.2 Cross competences	N/A

7. Discipline objective (as results from the *key competences gained*)

7.1 General objective	• The main objective of this discipline is to give to the students the bases of Logic Design, in order to make them able to analyze, design and implement any digital system.
7.2 Specific objectives	To reach this goal, students will learn to: • Analyze and synthesize combinational logic systems; • Analyze and synthesize synchronous and asynchronous sequential machines; • Apply digital system design principles and descriptive techniques; • Utilize programmable devices such as FPGAs and PLDs to implement digital systems; • Understand timing issues in digital systems and study these via digital circuit simulation.

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introduction. Number systems and codes, errors	2	Online presentations, discussions (face to face or using TEAMS platform, if necessary)	N/A
Number representation systems. Binary arithmetic	2		
Boolean Algebra. Boolean functions. Logic gates. Digital systems and functions representation	2		
Methods for minimizing Boolean functions and systems of functions	2		
Combinational logic circuits (CLCs) analysis and design (synthesis). SSI and MSI CLCs.	2		
Methods for designing digital systems with SSI, MSI, LSI and VLSI circuits. Combinational Hazard.	2		
Sequential logic circuits. Latches and Flip-Flops.	2		
Flip-Flops applications: frequency dividers, counters	2		
Flip-Flops applications: data registers, converters, memories	2		
Methods for designing digital systems using Flip-Flops	2		
Methods for designing digital systems using memories, multiplexers, decoders, counters	2		
Methods for designing sequential synchronous systems	2		
Methods for designing digital systems using programmable devices (I)	2		
Methods for designing digital systems using programmable devices (II)	2		

Bibliography

1. Contemporary Logic Design, Randy H. Katz, Benjamin Cunnings / Addison Wesley Publishing Co., 1993.
2. Digital Design Principles and Practices, John F. Wakerly, Prentice-Hall, 2000.
3. FPGA-based System Design, Wayne Wolf, PRENTICE HALL Professional Technical Reference Upper Saddle River, NJ 07458 www.phptr.com ISBN: 0-13-142461-0.

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Basic Logic Circuits	2	Practical work on test boards, FPGA boards, specialized software, blackboard	N/A
ActiveHDL Schematic Editor and Simulator (I)	2		
ActiveHDL Schematic Editor and Simulator (II)	2		
Combinational Logic Circuits (I)	2		
Combinational Logic Circuits (II) – MSI circuits	2		

Combinational Logic Circuits (III) – Complex circuits	2	presentations, supplemental explanations and discussions (face to face or using TEAMS platform, if necessary)	
Synthesis of Combinatorial Logic Circuits using Programmable Logic Devices	2		
Flip-flops	2		
Counters (I)	2		
Counters (II)	2		
Registers and Shift Registers	2		
The XILINX FPGA Family	2		
Synthesis of Sequential Logic Circuits using FPGA Devices	2		
Laboratory test	2		

Bibliography

1. Analiza şi sinteza dispozitivelor numerice, Îndrumător de laborator, Ediţia a-3-a, L. Văcariu, O. Creţ, A. Neţin, Ed. U.T. Press, Cluj-Napoca, 2009.

[*] *Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.*

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

• Since this discipline is a basic one in Computer Science, its content is "classic" but also modern because it familiarizes students with the modern principles of Logic Design (utilization of modern simulation and synthesis tools, FPGA and CPLD-based design etc.). Its contents have been discussed with major academia and industry actors from Romania, Europe and U.S.A. and it has been evaluated several times by Romanian Governmental Agencies like CNEAA and ARACIS.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Problems solving abilities Presence, (Inter)activity	Written Exam (face to face or using TEAMS platform, if necessary)	70%
Seminar			
Laboratory	Problems solving abilities Presence, (Inter)activity	(face to face or using TEAMS platform, if necessary)	30%
Project			

Minimum standard of performance:

• Conditions for participating in the final Written exam: Applications grade ≥ 5 AND a minimum of 80% course attendance rate;

• Conditions for passing the exam: Written exam grade ≥ 5;

• Modeling and solving typical Logic Design problems using the domain-specific formal apparatus.

Date of filling in:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	Course	Prof. dr. eng. Octavian Cret	
	Applications	As.drd.ing. Diana Pop	
		ing. Noema Maier	
		ing. Bogdan Vlad Zirbo	

Date of approval in the department	Head of department Prof.dr.ing. Rodica Potolea
Date of approval in the Faculty Council	Dean Prof.dr.ing. Liviu Miclea