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	55.1

2. Data about the subject

2.1 Subject name	***Input/output systems and peripheral devices***				
2.2 Course responsible / lecturer	Prof. er. eng. Baruch Zoltan-Francisc - Zoltan.Baruch@cs.utcluj.ro				
2.3 Teachers in charge of seminars / Laboratory / project	Prof. er. eng. Baruch Zoltan-Francisc - Zoltan.Baruch@cs.utcluj.ro				
2.4 Year of study	IV	2.5 Semester	2	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*				DS
	DI – Impusă, DOp – opțională, DFac – facultativă				DOp

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	34
(b) Supplementary study in the library, online and in the field	12
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	18
(d) Tutoring	
(e) Exams and tests	5
(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	Computer Programming, Computer Architecture
4.2 Competence	Competences of disciplines Computer Programming and Computer Architecture

5. Requirements (where appropriate)

5.1. For the course	Projector, computer
5.2. For the applications	Computers, the Microsoft Visual Studio programming environment

6. Specific competence

6.1 Professional competences	**C4** – Improving the performances of the hardware, software, and communication systems (2 credits) • **C4.1** – Identifying and describing the defining elements of the performances of the hardware, software, and communication systems • **C4.2** – Explaining the interaction of the factors that determine the performances of the hardware, software, and communication systems • **C4.3** – Applying the fundamental methods and principles for increasing the performances of the hardware, software, and communication systems • **C4.4** – Choosing the criteria and evaluation methods of the performances of the hardware, software, and communication systems • **C4.5 -** Developing performance based professional solutions for hardware, software and communication systems **C5** – Designing, managing the lifetime cycle, integrating and ensuring the integrity of hardware, software, and communication systems (3 credits) • **C5.1** – Specifying the relevant criteria regarding the lifetime cycle, quality, security and the computing system's interaction with the environment and the human operator • **C5.2 -** Using interdisciplinary knowledge for adapting an information system to application domain requirements • **C5.3** – Using fundamental principles and methods for ensuring the security, the safety and ease of exploitation of the computing systems • **C5.4 -** Adequate utilization of quality, safety and security standards in information processing • **C5.5 -** Realization of a project including problem identification and analysis, design and development, while proving the understanding of the basic quality needs and requirements
6.2 Cross competences	N/A

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

7.1 General objective	Knowledge of operation and performance parameters for input/output interfaces and peripheral devices; ability to communicate with controllers of peripheral devices
7.2 Specific objectives	- Using basic methods and principles for enhancing performance of computer systems - Designing input/output interfaces for connecting various devices to the computer - Designing and implementing in software input/output protocols - Writing system programs for controlling input/output interfaces

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introduction. Programmed I/O	2	- PowerPoint presentations - Questions, discussions	
Interrupt-Driven I/O. Direct Memory Access. I/O Processors	2		
Buses. Electrical Considerations. Synchronous and Asynchronous Buses. Parallel and Serial Buses. Bus Arbitration. PCI Bus	2		
PCI Express Bus. I^2C Bus. SPI Bus	2		
Universal Serial Bus. VME Bus. Expansion Modules for Embedded Systems. VME Modules	2		
Expansion Modules for Embedded Systems (cont.). CompactPCI Modules. Mezzanine Modules. COM Express Modules	2		
Liquid Crystal Displays. Liquid Crystals. Twisted Nematic Technology. Addressing Methods. Backlighting Types	2		
Liquid Crystal Displays (cont.). Display Parameters. Vertical			

Alignment Technology. In-Plane Switching Technology	2		
Organic LED Displays. Electronic Paper Displays	2		
Electronic Paper Displays (cont.). Quantum Dot Displays	2		
Graphics Adapters. Structure of a Graphics Adapter. Graphics Memory. Graphics Processing Units	2		
Graphics Processing Units (cont.). Display Interfaces: HDMI; DisplayPort	2		
Optical Discs. Classification of Optical Discs. Compact Discs. DVD Discs	2		
Blu-Ray Discs	2		
Bibliography: 1. Baruch, Z. F., Input/Output Systems, MEGA, Cluj-Napoca, 2020, ISBN 978-606-020-242-4. 2. Rosch, Winn L., Hardware Bible, Sixth Edition, Que Publishing, 2003, ISBN 0-7897-2859-1.			
8.2 Applications - Seminars / Laboratory / Project	Hours	Teaching methods	Notes
Serial Port (I)	2	- Additional explanations - Using a programming environment for the C language	
Serial Port (II)	2		
PCI Express Bus (I)	2		
PCI Express Bus (II)	2		
System Management Bus (I)	2		
System Management Bus (II)	2		
Universal Serial Bus (I)	2		
Universal Serial Bus (II)	2		
Printers	2		
SCSI Interface	2		
ATA Interface (I)	2		
ATA Interface (II)	2		
Compact Discs. ATAPI Interface	2		
Laboratory Colloquy	2		
Bibliography: 1. Baruch, Z. F., Input/Output Systems, MEGA, Cluj-Napoca, 2020, ISBN 978-606-020-242-4. 2. Rosch, Winn L., Hardware Bible, Sixth Edition, Que Publishing, 2003, ISBN 0-7897-2859-1. 3. Lecture slides and laboratory works at http://users.utcluj.ro/~baruch/en/pages/teaching/inputoutput-systems.php			

**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

The contents of the discipline have been corroborated with the contents of similar disciplines in the USA and Europe, as well as with chapters related to input/output systems of acknowledged manuals used in prestigious universities. The discipline has been evaluated by the ARACIS agency.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Understanding theoretical concepts of input/output systems and the principle of operation for peripheral devices	Quizzes at the lectures	10%
			50%
Laboratory	Ability to write communication programs with controllers of peripheral devices	Assessment of solving the assigned applications at the laboratory sessions and laboratory colloquy	40%
Project	-	-	-

Minimum standard of performance:
Finishing at least one application in each laboratory session Grade calculus: 10% Quizzes + 40% Laboratory + 50% Exam
Conditions for entering the final exam: Quizzes ≥ 5, Laboratory ≥ 5
Conditions for promotion: Exam ≥ 5

Date of filling in: 26.02.2025	**Responsible**	**Title / First name - Last name**	**Signature**
	Course	Prof. dr. eng. Zoltan-Francisc BARUCH	
	Applications	Prof. dr. eng. Zoltan-Francisc BARUCH	

Date of approval in the department	Head of department, Prof.dr.eng. Rodica Potolea
Date of approval in the Faculty Council	Dean, Prof.dr.eng. Vlad Mureșan