SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrotechnics and Measurements
1.4	Field of study	Electrical Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/ Qualification	Electrical System Cluj-Napoca in English language
1.7	Form of education	Full time
1.8	Subject code	22.10

2. Data about the subject

2.1	Subject name			PC architectures and operating systems	
2.2	Course responsible/ lecturer			Assistant professor eng. Anca Iulia NICU, PhD	
2.3	Teachers in charge of Seminars/ Laboratory/ Project			Assistant professor eng. Anca Iulia NICU, PhD	
2.4 Year of study	II	2.5 Semester	I	2.6 Type of assessment *(E – exam, C – colloquium, V – verification)*	C
2.7 Subject category	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DS
	DI – compulsory, DO – elective, Dfac – optional				DO

3. Estimated total time

3.1 Number of hours per week:	3	of which	3.2 Course	2	3.3 Seminar	…	3.3 Laboratory	1	3.3 Project	
3.2 Total hours per semester	42	of which	3.5 Course	28	3.6 Seminar	…	3.6 Laboratory	14	3.6 Project	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	15
(b) Supplementary study in the library, online and in the field	5
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	5
(d) Tutoring	-
(e) Exams and tests	3
(f) Other activities	-

3.8 Total hours of individual study *[sum (3.7(a) to 3.7(f))]*	33
3.9 Total hours per semester *[sum of 3.4 and 3.8]*	75
3.10 Number of credit points	3

4. Prerequisites (where applicable)

4.1	Curriculum	Computer programming and programming languages 1
4.2	Competences	Notions of mathematical logic Basic knowledge of numerical analysis and differential equations (useful for understanding advanced hardware architectures. Knowledge of the functions of a computer Understanding of fundamental programming concepts such as variables, loops, functions, pointers and data structures.

5. Requirements (where appropriate)

5.1	For the course	Room with multimedia facilities or online using MS Teams when needed
5.2	For the applications	Laboratory with workstations with Windows operating systems (or online, using the facilities offered by MS Teams when needed) with internet access

6. Specific competences

Professional competences	Working with fundamental concepts in computer science and information technology. Description of the architecture, operation and structure of computing systems, including hardware components (CPU, memory, input/output devices) and their interactions. Analysing and designing IT solutions using specific algorithms, logic schemes, models and protocols. Apply knowledge of programming languages, environments and technologies to optimize and develop software applications in relevant technical contexts
Cross competences	Effective use of information sources and communication resources (Internet portals, specialized software applications, databases, online course platforms) in Romanian and in at least one language of international circulation. Autonomous development of learning skills by identifying and leveraging continuing education resources and technologies. Effective time and resource management to solve complex technical problems and adapt to ever-changing technology requirements.

7. Expected learning outcomes

Knowledge	The student/graduate identifies and describes basic concepts, principles, and methods in mathematics, physics, chemistry, technical drawing, economics, and computer science.
Abilities	The student/graduate operates with basic concepts, principles, and methods from fundamental disciplines.
Responsibility and autonomy	The student/graduate applies the values of ethics and deontology of the engineering profession.

8. Discipline objectives (based on specific competencies acquired)

7.1	General objective	Acquire fundamental knowledge of computer architecture and operation, as well as the structure, functions and features of modern operating systems. Developing practical skills by using current operating systems (desktop and mobile) and doing hands-on projects such as creating a web page using HTML.

7.2	Specific objectives	Understanding of the fundamental principles of Computer Architecture and OS, with an emphasis on technological evolution and trends. Knowledge of the main components of operating systems (kernel, shell, process, memory and file managers) and their roles. Understanding the mechanisms of interaction between users, applications and hardware through the operating system. Practical application of theoretical knowledge by exploring modern operating systems (eg: Windows 11) Develop technical problem-solving and analysis skills through practical examples that include optimization and efficient use of system resources. Familiarity with the basics of web development by creating a web page using current standards, with attention to accessibility and compatibility on various devices

9. Contents

9.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Introduction: Numerical calculators; The structure of the physical machine	2	Interactive presentation, conversation, case studies, directed observation, practical exercises	Provides a fundamental understanding of CA and SO, indispensable skills for the design, use and optimization of modern SEs, which are increasingly dependent on IT technologies and hardware-software integration
2	Architectures for computing systems: Central processing units; Internal memory characteristics	2		
3	Computer Arithmetic: Circuits for adding two binary digits; Operations with fixed-point numbers	2		
4	Computer Arithmetic: Floating Point Operations	2		
5	Computer language: UCP structure; Registers; The elements of a machine instruction; Types of instructions;	2		
6	Computer Performance: Performance Evaluation, Instruction Execution, Pipeline	2		
7	File systems: Structure and functionality; The role of drivers in the OS	2		
8	Memory hierarchy: Cache memory, virtual memory	2		
9	I/E unit: I/E unit structure; Types of peripheral equipment; Safety and reliability	2		
10	Concepts of operating systems: General characteristics	2		
11	Concepts of operating systems: Architecture, Interrupt handling	2		
12	Windows operating system: Resource management; Networking; Security	2		
13	Mobile Operating Systems: Mobile OS Architecture and Applications	2		
14	Mobile operating systems: iOS & Android	2		

Bibliography

[1] **Patterson, D.A., Hennessy, J.L.** - *Computer Organization and Design: The Hardware/Software Interface*, Elsevier, 2018 (6th Edition).
[2] **Tanenbaum, A., Bos, H.** - *Modern Operating Systems*, Pearson, 2014 (4th Edition).
[3] **Silberschatz, A., Galvin, P.B.** - *Operating System Concepts*, Wiley, 2020 (10th Edition).
[4] **HTML & CSS Tutorials**: https://developer.mozilla.org/ (MDN Web Docs).
[5] **Arduino Resources**: https://www.arduino.cc/.
[6] **Microsoft Windows Documentation**: https://learn.microsoft.com/en-us/windows/.
[7] **Linux Documentation Project**: https://tldp.org/.

9.2. Applications - Laboratory		Number of hours	Teaching methods	Additional remarks
1	Browsing the Internet. Creating web pages using HTML	2	Exercises, practical demonstrati	
2	Creating web pages using HTML and CSS	2		
3	Representation of numbers in fixed and floating point	2	ons (on-site/online), individual or collaborative projects	
4	Configuring and managing users in Windows. Manage Windows components and applications. Setting Internet options	2		
5	Exploring Computer Architectures and Performance Analysis with PCjs	2		
6	Introduction to System Resource Management: Monitoring and Optimization (practical concepts related to managing system resources such as CPU, RAM, storage, and networks using freely available tools (Task Manager, Resource Monitor, htop, Glances, or Performance monitor)	2		
7	Using ARDUINO in Engineering Applications: Introduction to Hardware and Programming	2		

Bibliography

[1] **Patterson, D.A., Hennessy, J.L.** - *Computer Organization and Design: The Hardware/Software Interface*, Elsevier, 2018 (6th Edition).
[2] **Tanenbaum, A., Bos, H.** - *Modern Operating Systems*, Pearson, 2014 (4th Edition).
[3] **Silberschatz, A., Galvin, P.B.** - *Operating System Concepts*, Wiley, 2020 (10th Edition).
[4] **HTML & CSS Tutorials**: https://developer.mozilla.org/ (MDN Web Docs).
[5] **Arduino Resources**: https://www.arduino.cc/.
[6] **Microsoft Windows Documentation**: https://learn.microsoft.com/en-us/windows/.
[7] **Linux Documentation Project**: https://tldp.org/.

10. Alignment of course content with expectations of the epistemic community, professional associations, and representative employers in the field

The analytical syllabus for the course and laboratory was developed based on consultation with representatives of IT and engineering companies, reflecting the current demands of the labour market. Interviews with graduates of the program employed in the industry provided valuable insights into the skills required.

Also, the content of the discipline was correlated with similar programs from other universities in Romania and abroad, ensuring a competitive and up-to-date approach. Emphasis is placed on the development of practical skills and a solid theoretical foundation, according to current professional requirements and international academic standards.

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade (%)
11.4 Course	correctness and completeness of knowledge; logical coherence; degree of assimilation of the specialized language;	Written grid test type work (or using the MS Team platform if required)	60%
11.5 Laboratory	- the ability to operate with assimilated knowledge. - the ability to apply in practice.	-1 P (project containing web page development, written documentation, ppt presentation)	40%
11.6 Minimum standard of performance: Understanding of basic concepts and terminology; Problem solving Laboratory activity -1 P (project containing web page development, written documentation, ppt presentation)			

Date of completion	**Lecturers**	**Title/ Surname/ Name:**	**Signature**
September 2025	Course	Asst.prof.eng. Anca Iulia NICU, PhD	
	Applications Seminar/	Asst.prof.eng. Anca Iulia NICU, PhD	

Date of approval in the ETHM Department Council January 2026	**Head of Department:** Prof. Eng. MICU Dan Doru, PhD
Date of approval in the Faculty of Electrical Engineering Council February 2026	**Dean:** Assoc. Prof. Eng. CZIKER Andrei, PhD