

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	12.00

2. Data about the subject

2.1	Subject name	Computer programming and programming languages II				
2.2	Course responsible/ lecturer	Conf.dr.eng. Grindei Violeta Laura				
2.3	Teachers in charge of Seminars/ Laboratory/ Project	Lect. dr.eng. Constantinescu Claudia				
2.4	Year of study	1	2.5 Semester	2	2.6 Type of assessment (<i>E – exam, C – colloquium, V – verification</i>)	E
2.7	Subject category	<i>DF – fundamental, DD – in the field, DS – specialty, DC – complementary</i>				DF
		<i>DI – compulsory, DO – elective, Dfac – optional</i>				DI

3. Estimated total time

3.1	Number of hours per week:	4	of which	3.2	2	3.3		3.3	2	3.3	
				Course		Seminar		Laboratory		Project	
3.2	Total hours per semester	125	of which	3.5	28	3.6		3.6	28	3.6	
				Course		Seminar		Laboratory		Project	
3.7 Individual study:											
(a) Manual, lecture material and notes, bibliography										24	
(b) Supplementary study in the library, online and in the field										17	
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										18	
(d) Tutoring										6	
(e) Exams and tests										4	
(f) Other activities										0	
3.8 Total hours of individual study [sum (3.7(a) to 3.7(f))]						69					
3.9 Total hours per semester [sum of 3.4 and 3.8]						125					
3.10 Number of credit points						5					

4. Prerequisites (where applicable)

4.1	Curriculum	Completing PCLP I
4.2	Competences	Competences from PCLP I

5. Requirements (where appropriate)

5.1	For the course	Projector
5.2	For the applications	Computers room

6. Specific competences

Professional competences	<ul style="list-style-type: none"> ability to identify, formulate and solve engineering problems in a system approach ability to apply engineering knowledge, engineering sciences, and applied computer science. ability to use software products for monitoring and controlling processes specific to energy engineering while ensuring the safety of personnel in electrical installations of any level.
Cross competences	<ul style="list-style-type: none"> Flexibility in approaching and practically applying the latest technologies in the areas of expertise undertaken. ability to work in interdisciplinary and multidisciplinary teams, to communicate effectively, and to understand professional and ethical responsibilities.

7. Expected learning outcomes

Knowledge	The student/graduate explains, uses, and interprets theoretical and experimental results from mathematics, physics, chemistry, economics, technical drawing, computer science, and engineering.
Abilities	<p>The student/graduate applies evaluation criteria and methods for identifying, modeling, experimenting, analysis and qualitative and quantitative assessment of phenomena and processes specific to the fundamental field using digital technologies.</p> <p>The student/graduate acquires and processes data, interprets theoretical and experimental results.</p> <p>The student/graduate develops technical drawings of execution and assembly in letter format or designed by computer aid.</p>
Responsibility and autonomy	The student/graduate is engaged in lifelong learning for the acquisition and implementation of knowledge as needed using appropriate learning strategies.

8. Discipline objectives (based on specific competencies acquired)

7.1	General objective	The use of advanced programming languages and the acquisition of basic skills in designing and implementing programs in C/C++/Python in Electrical Engineering field.
7.2	Specific objectives	The student must be able to design and implement complex applications to solve problems in the field of energy engineering using C/C++/Python programming languages.

9. Contents

9.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Pointers. Pointers to arrays. Arrays of pointers. Pointers to pointers. Pointers to functions. Functions with pointer arguments.	2		
2	Dynamic memory allocation. Dynamic allocation functions.	2		
3	Command line. Arguments of the main() function.	2		

4	Defining, declaring, and accessing elements of structures. Structures and functions. Pointers to structures. Arrays of structures.Sorting algorithms.	2	ppt tutorials	Quiz evaluation tests		
5	Defining, declaring, and accessing elements of unions, enumerations, bit fields, lists (implementation of specific list types).	2				
6	Defining and using file operations in C.	2				
7	Streams cin and cout.	2				
8	Structuring C/C++ programs into modules.					
9	Differences between C/C++. C++ Libraries. Standard Template Library in C++: algorithms (for sorting, selection, and binary search of data stored in containers), containers: vector, list, map, set, and stack, iterators: forward_iterator, bidirectional_iterator, and random_access_iterator, functors-function objects, adaptors.	2				
10	OOP: Defining objects, classes, and methods used in object-oriented programming. The concept of inheritance. Classes and friend functions. Common class functions (constructor, destructor).	2				
11	File operations in C++.	2				
12	Mathematical applications implemented in C/C++ in the field of electrical engineering: polynomials, polynomial differentiation, Taylor series expansions of trigonometric functions, applications with mean values, effective values, mean absolute deviation values, error calculation, integral applications.	2				
13	Applications in C/C++ for solving electrical circuit problems.	2				
14	Introduction to Python. Python applications in electrical engineering: graphical representation of 2D and 3D numerical data, animated graphs, waveforms.	2				
Bibliography						
[1] Aplicații C/C++/C# și Arduino în Inginerie Electrică, Laura Grindei, Claudia Constantinescu, Marius Purcar, manual on line: https://biblioteca.utcluj.ro/files/carti-online-cu-coperta/435-3.pdf						
9.2. Applications - Seminar /Laboratory/Project		Number of hours			Teaching methods	Additional remarks
1	Implementing C/C++ programs to solve problems using pointers and pointer operations.	2	Implementati on and testing of programs on the computer in Code::Blocks			
2	Implementing C/C++ programs to solve problems using pointers to arrays.	2				
3	Implementing C/C++ programs to solve problems using arrays of pointers.	2				
4	Implementing C/C++ programs to solve problems using pointers to pointers and pointers to functions.	2	Completion of 9 online tests in Teams			
5	Implementing C/C++ programs to solve problems using dynamic memory allocation.	2				

6	Implementing C/C++ programs to use the command line and arguments of the main() function.	2		
7	Implementing C/C++ programs to solve problems using structures, structures as function arguments, and pointers to structures.	2		
8	Implementing C/C++ programs to solve problems using arrays of structures and sorting algorithms for them.	2		
9	Implementing C/C++ programs to solve problems using unions, enumerations, bit fields, lists (implementation of specific list types).	2		
10	Implementing C++ programs using C++ I/O: cin, cout.	2		
11	Implementing C++ programs with classes and methods.	2		
12	Implementing practical applications in electrical engineering: polynomials, polynomial differentiation, Taylor series of trigonometric functions, applications with mean values, effective values, mean absolute deviation values, error calculation, integral applications.	2		
13	Applications in C/C++ in electrical engineering: solving problems with electrical circuits: equivalent resistance calculation, voltage divider, matrix solution of a system of equations that simplifies the solution of an electrical circuit.	2		
14	Implementing Python applications. 2D and 3D graphical representations using Python.	2		
<p>Bibliography [1] Aplicații C/C++/C# și Arduino în Inginerie Electrică, Laura Grindei, Claudia Constantinescu, Marius Purcar, manual on line: https://biblioteca.utcluj.ro/files/carti-online-cu-coperta/435-3.pdf</p>				

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

The content of the course is in line with what is taught in other Electrical Engineering faculties, both within the other university centers in the country and abroad.

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade (%)
11.4 Course	The level of theoretical knowledge accumulation is tested through a written test with questions regarding the interpretation of C/C++ code sequences and the writing of a C/C++ program to solve electrical engineering problem.	Multiple-choice test + one C/C++ code to solve an electrical engineering problem.	50%

11.5 Laboratory	The level of practical knowledge accumulated during laboratories is tested through online tests	9 multiple choice online tests in Teams	50%
11.5 Project			
11.6 Minimum standard of performance: Final mark =(theoretical test mark +average of 9 laboratory tests)/2=minimum 5			

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
September 2025	Course	Conf. dr. ing. Violeta Laura GRINDEI	
	Applications Seminar/ Laboratory/ Project	Conf. dr. ing. Violeta Laura GRINDEI	
		s.l.dr. ing.Claudia Constantinescu	

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