

## SYLLABUS

### 1. Program information

|                                   |                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------|
| 1.1 Higher education institution  | Technical University of Cluj-Napoca                                               |
| 1.2 Faculty                       | Faculty of Electronics, Telecommunications and Information Technology             |
| 1.3 Department                    | Bases of Electronics                                                              |
| 1.4 Field of study                | Electronic engineering, telecommunications and information technologies           |
| 1.5 Cycle of study                | Bachelor of Science                                                               |
| 1.6 Study program / Qualification | Electronic engineering, telecommunications and information technologies/ Engineer |
| 1.7 Form of education             | IF – full-time education                                                          |

### 2. Course information

|                                                                  |                                                                        |                        |      |
|------------------------------------------------------------------|------------------------------------------------------------------------|------------------------|------|
| 2.1 Course title                                                 | Computer Programming and Programming Languages I                       | Course code            | 4.00 |
| 2.2 Course coordinator                                           | Professor, PhD Eng. Mircea-Florin Vaida,<br>Mircea.Vaida@com.utcluj.ro |                        |      |
| 2.3 Seminar/ laboratory/ project/ practical activity coordinator | Professor, PhD Eng. Mircea-Florin Vaida,<br>Mircea.Vaida@com.utcluj.ro |                        |      |
| 2.4 Year of study                                                | I                                                                      | 2.5 Semester           | 1    |
|                                                                  |                                                                        | 2.6 Type of assessment | E    |
| 2.7 Course status                                                | Formative category                                                     |                        | DF   |
|                                                                  | Optionality                                                            |                        | DOB  |

### 3. Estimated total time

|                                                                                                    |    |           |             |    |             |   |                |    |             |   |                        |   |
|----------------------------------------------------------------------------------------------------|----|-----------|-------------|----|-------------|---|----------------|----|-------------|---|------------------------|---|
| 3.1 Hours per week                                                                                 | 4  | of which: | 3.2 Lecture | 2  | 3.3 Seminar | 0 | 3.3 Laboratory | 2  | 3.3 Project | 0 | 3.3 Practical training | 0 |
| 3.4 Hours per semester                                                                             | 56 | of which: | 3.5 Lecture | 28 | 3.6 Seminar | 0 | 3.6 Laboratory | 28 | 3.6 Project | 0 | 3.3 Practical training | 0 |
| 3.7 Time distribution (hours per semester) for individual study and assessment:                    |    |           |             |    |             |   |                |    |             |   |                        |   |
| (a) Assessment                                                                                     |    |           |             |    |             |   |                |    |             |   | 3                      |   |
| (b) Study using textbook, course materials, bibliography, and notes                                |    |           |             |    |             |   |                |    |             |   | 34                     |   |
| (c) Additional documentation in the library, on specialized electronic platforms, and in the field |    |           |             |    |             |   |                |    |             |   | 9                      |   |
| (d) Preparation for seminars/laboratories, assignments, reports, portfolios and essays             |    |           |             |    |             |   |                |    |             |   | 20                     |   |
| (e) Tutoring                                                                                       |    |           |             |    |             |   |                |    |             |   | 2                      |   |
| (f) Other activities                                                                               |    |           |             |    |             |   |                |    |             |   | 1                      |   |
| 3.8 Total hours of individual study and assessment (sum of (3.7(a))...3.7(f))                      |    |           |             |    |             |   |                |    | 69          |   |                        |   |
| 3.9 Total hours per semester (3.4+3.8)                                                             |    |           |             |    |             |   |                |    | 125         |   |                        |   |

|                        |     |
|------------------------|-----|
| 3.10 Number of credits | 5.0 |
|------------------------|-----|

**4. Prerequisites** (where applicable)

|                  |                                                                               |
|------------------|-------------------------------------------------------------------------------|
| 4.1 curriculum   | Basic high school in mathematics, physics, computer science                   |
| 4.2 competencies | Basic knowledge of computer science, physics and mathematics from high school |

**5. Requirements** (where applicable)

|                                                              |                                     |
|--------------------------------------------------------------|-------------------------------------|
| 5.1. for the development of the lecture                      | Video-projector, screen, whiteboard |
| 5.2. for the development of the seminar/ laboratory/ project | PCs with Internet access            |

**6. Specific competencies acquired**

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Professional competencies | <p>C3. Application of the basic knowledge, concepts and methods regarding the architecture of computer systems, microprocessors, microcontrollers, languages and programming</p> <p>C3.1 Description of the functioning of a computing system, of the basic principles of the architecture of general-purpose microprocessors and microcontrollers, of the general principles of structured programming</p> <p>C3.2 Use of general-purpose and specific programming languages to microprocessor and microcontroller applications; explaining the functioning of automatic control systems that use these architectures and interpreting experimental results</p> <p>C3.3 Solving concrete practical problems including elements of data structures and algorithms, programming and use of microprocessors or microcontrollers</p> <p>C3.4 Elaboration of programs in a general and/ or specific programming language, starting from the specification of the requirements to the execution, debugging and interpretation of the results in correlation with the processor used.</p> <p>C3.5 Development of projects involving hardware components (processors) and software components (programming)</p> <p>C4. Design, implementation and operation of data, voice, video and multimedia services. This is based on the understanding and the application of fundamental concepts in telecommunications and transmission of information</p> <p>C4.1 Identification of the fundamental concepts regarding the transmission of information and analog and digital communications</p> <p>C4.2 Solving practical problems using general knowledge of multimedia techniques</p> <p>C4.3 Explanation and interpretation of the main requirements and specific approach techniques for data, voice, video, multimedia transmissions</p> <p>C4.3 Solving practical problems using general knowledge of multimedia techniques</p> <p>C4.4 Use of the main specific parameters in evaluations based on the concept of quality of service in communications</p> <p>C4.5 Development of simple communications services</p> |
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|                           |                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Professional competencies | C5. Selecting, installing, configuring and operating fixed or mobile telecommunications equipment. Equipping a site with usual telecommunications networks<br>C5.3 Installation, configuration and exploiting of communications networks<br>C5.5 Endowment with communications means of a location with a small/ medium degree of complexity |
| Transversal competence    |                                                                                                                                                                                                                                                                                                                                              |

## 7. Expected learning outcomes

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knowledge                   | <ul style="list-style-type: none"> <li>- The student/graduate identifies and describes basic concepts, principles and methods in mathematics, physics, chemistry, technical drawing, economics and computer science.</li> <li>- The student/graduate describes, identifies and summarizes elementary concepts and methods concerning computer system architecture, microcontrollers, programming</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Skills                      | <ul style="list-style-type: none"> <li>- The student/graduate solves mathematics, physics and chemistry problems with engineering applicability and validates the solution obtained.</li> <li>- The student/graduate evaluates, based on specific performance criteria, the type of computing system, its architecture and the manner of use required for efficiently solving concrete problems.</li> <li>- The student/graduate specifies requirements, develops programs in general-purpose programming languages (C, etc.) and/or object-oriented languages (C++, Java, etc.), runs and debugs them, and interprets the results of the programs developed in order to solve a concrete problem.</li> </ul>                                                                                                                                                                                                                                                                                                                                             |
| Responsibility and autonomy | <ul style="list-style-type: none"> <li>- The student/graduate applies the values of ethics and professional deontology specific to the engineering profession.</li> <li>- The student/graduate applies logical reasoning, evaluation and self-assessment in decision-making.</li> <li>- The student/graduate communicates effectively about engineering activities with a wide range of audiences.</li> <li>- The student/graduate is engaged in lifelong learning in order to acquire and implement knowledge, as needed, using appropriate learning strategies.</li> <li>- The student/graduate promotes dialogue, cooperation, respect for others and interculturality.</li> <li>- The student/graduate works effectively as a team member or as a team leader.</li> <li>- The student/graduate fluently uses at least one international language in technical communication.</li> <li>- The student/graduate behaves honourably, responsibly and ethically, in the spirit of the law, in order to ensure the reputation of the profession.</li> </ul> |

## 8. Course objectives (based on the grid of specific competencies acquired)

|                                     |                                                           |
|-------------------------------------|-----------------------------------------------------------|
| 8.1 General objective of the course | Development of basic competences in programming languages |
|-------------------------------------|-----------------------------------------------------------|

|                         |                                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------|
| 8.2 Specific objectives | 1. Theoretical knowledge about C/C++ language.<br>2. Practical abilities to use Microsoft Visual Studio, VC++ IDE. |
|-------------------------|--------------------------------------------------------------------------------------------------------------------|

## 9. Contents

| 9.1 Lecture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No. of hours | Teaching methods           | Remarks |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------|---------|
| Introduction in computer programming - algorithms. Classification and evolution of programming languages, programming principles. Anatomy of a computer. Basic data and instruction types.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2            | Presentations, discussions |         |
| Introduction concerning C/C++ programming. Predefined data types. General aggregate types: arrays, structures. Functions. Basic elements of preprocessing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2            |                            |         |
| Input/output operations in C/C++, ( <i>printf()</i> , <i>scanf()</i> , <i>scanf_s( )</i> , <i>cout</i> , <i>cin</i> and <i>wide</i> variants).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2            |                            |         |
| Operators in C/C++ language.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 2            |                            |         |
| Control of program flow in C/C++.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2            |                            |         |
| Initialization of variables and arrays. Memory classes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2            |                            |         |
| Arrays: one/multi- dimensional, operations, parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2            |                            |         |
| Pointers in C/C++. Arguments transfer by address with pointers and references.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2            |                            |         |
| Pointers and arrays. Pointers to functions. String library functions. Arguments transfer to <i>main( )</i> function.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2            |                            |         |
| Dynamic memory allocation in C/C++.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2            |                            |         |
| User defined data types, struct, unions, bit fields, typedef-using, enum.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2            |                            |         |
| Other input/output elements in C/C++. Files in C (text, binary, direct access).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2            |                            |         |
| New considerations concerning preprocessing and macro functions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2            |                            |         |
| New considerations concerning functions in C/C++: inline, constant parameters, variable no. of parameters, overloading. Standard C/C++ library.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2            |                            |         |
| Bibliography<br><b><i>In TUC-N library</i></b><br>1. Vaida M., Bazele dezvoltarii aplicatiilor software in electronica si telecomunicatii, curs, litografia UTC-N, 1997<br>2. Mircea-Florin Vaida, Petre G. Pop, Cosmin Strilețchi, Ligia Chiorean, Calin G. Login, Tehnologii avansate privind dezvoltarea aplicatiilor software in limbajul C/C++, Casa Cartii de Stiinta, 2006<br>3. Ligia Chiorean, Mircea-Florin Vaida, Petre G. Pop, Cosmin Strilețchi, Elemente de bază și obiectuale privind dezvoltarea ampliatio în limbajul de programare C/C++, UTPress, 2007/2008<br>4. Mircea-Florin Vaida, Ligia-Domnica Chiorean, Lenuța Alboai, Petre Gavril Pop, Cosmin Strilețchi, Kuderna-Iulian Bența, Programarea în limbajul C/C++ cu elemente C++1y. Programare web C++, Casa Cartii de Stiinta, Cluj-Napoca, 2016<br>5. Ligia-Domnica Chiorean, Kuderna-Iulian Bența, Mircea-Florin Vaida, Petre Gavril Pop, Cosmin Strilețchi, C/C++ - Ghid teoretic si practic, Casa Cartii de Stiinta, Cluj-Napoca, 2016 |              |                            |         |

| 9.1 Lecture                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | No. of hours | Teaching methods | Remarks |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|---------|
| <p>6. Mircea-F. Vaida, Ligia D. Chiorean, Adriana Stan, Cosmin Strilețchi, Petre G. Pop, Ștefan-S. Dragoș, Aplicații de bază folosind C/C++. Elemente practice. Varianta bilingvă - Basic applications using C/C++. Practical elements. Bilingual variant, UTPress, 2023</p> <p><b>Supplementary materials:</b><br/>- course notes at <a href="https://helios.utcluj.ro/learn2code/index.php">https://helios.utcluj.ro/learn2code/index.php</a><br/>Other information: Assessment, supplementary support from:<br/><a href="https://helios.utcluj.ro/learn2code/index.php">https://helios.utcluj.ro/learn2code/index.php</a></p> <p><b>Other libraries:</b></p> <p>7. Mircea-Florin Vaida, Petre Gavril Pop, Cosmin Strilețchi, Ligia-Domnica Chiorean, Lenuța Alboae, Programarea în limbajul C/C++. Algoritmi de bază în C/C++, Editura: Casa Cărții de Știință, Cluj-Napoca, 2011</p> <p>8. Ligia-Domnica Chiorean, Kuderna-Iulian Bența, Mircea-Florin Vaida, Petre Gavril Pop, Cosmin Strilețchi, Elemente practice de bază pentru programarea în limbajul C/C++ - editia a doua adaugita si revizuita, Casa Cartii de Stiinta, Cluj-Napoca, 2013</p> |              |                  |         |

| 9.2 Seminar /laboratory /project /practical training                                                                                                                                                    | No. of hours | Teaching methods           | Remarks |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------|---------|
| The Anatomy of a Computer. Operating systems. Files. Internet. Artificial Intelligence. The end of classical programming?                                                                               | 2            | Presentations, discussions |         |
| Codes. Numeration systems                                                                                                                                                                               | 2            |                            |         |
| Pseudo code. Algorithms.                                                                                                                                                                                | 2            |                            |         |
| Minimum C/C++ applications                                                                                                                                                                              | 2            |                            |         |
| Basic input/output operations in C/C++, ( <i>printf()</i> , <i>scanf()</i> , <i>scanf_s()</i> , <i>cout</i> , <i>cin</i> and wide variants).                                                            | 2            |                            |         |
| Operators and expressions in C/C++.                                                                                                                                                                     | 2            |                            |         |
| Instructions in C/C++. Debugging                                                                                                                                                                        | 2            |                            |         |
| Arrays, operations with arrays. Partial evaluation.                                                                                                                                                     | 2            |                            |         |
| Pointers in C/C++. Arguments transfer by address with pointers and references.                                                                                                                          | 2            |                            |         |
| Pointers and arrays. Pointers to functions. Arguments transfer to <i>main( )</i> function.                                                                                                              | 2            |                            |         |
| Dynamic memory allocation in C/C++.                                                                                                                                                                     | 2            |                            |         |
| Structures included structures. Pointers and data structures. Other user data types.                                                                                                                    | 2            |                            |         |
| Text files, binary files in C.                                                                                                                                                                          | 2            |                            |         |
| Final evaluation.                                                                                                                                                                                       | 2            |                            |         |
| Bibliography                                                                                                                                                                                            |              |                            |         |
| <b>In TUC-N library</b>                                                                                                                                                                                 |              |                            |         |
| 1. Vaida M., Bazele dezvoltarii aplicatiilor software in electronica si telecomunicatii, curs, litografia UTC-N, 1997                                                                                   |              |                            |         |
| 2. Mircea-Florin Vaida, Petre G. Pop, Cosmin Striletschi, Ligia Chiorean, Calin G. Login, Tehnologii avansate privind dezvoltarea aplicatiilor software in limbajul C/C++, Casa Cartii de Stiinta, 2006 |              |                            |         |

| 9.2 Seminar /laboratory /project /practical training                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | No. of hours | Teaching methods | Remarks |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|---------|
| <p>3. Ligia Chiorean, Mircea-Florin Vaida, Petre G. Pop, Cosmin Strilețchi, Elemente de bază și obiectuale privind dezvoltarea ampliată în limbajul de programare C/C++, UTPress, 2007/2008</p> <p>4. Mircea-Florin Vaida, Ligia-Domnica Chiorean, Lenuța Alboai, Petre Gavril Pop, Cosmin Strilețchi, Kuderna-Iulian Bența, Programarea în limbajul C/C++ cu elemente C++1y. Programare web C++, Casa Cartii de Stiinta, Cluj-Napoca, 2016</p> <p>5. Ligia-Domnica Chiorean, Kuderna-Iulian Bența, Mircea-Florin Vaida, Petre Gavril Pop, Cosmin Strilețchi, C/C++ - Ghid teoretic și practic, Casa Cartii de Stiinta, Cluj-Napoca, 2016</p> <p>6. Mircea-F. Vaida, Ligia D. Chiorean, Adriana Stan, Cosmin Strilețchi, Petre G. Pop, Ștefan-S. Dragoș, Aplicații de bază folosind C/C++. Elemente practice. Varianta bilingvă - Basic applications using C/C++. Practical elements. Bilingual variant, UTPress, 2023</p> <p><b>Supplementary materials:</b><br/>- laboratory materials available on the Helios platform: <a href="https://helios.utcluj.ro/learn2code/index.php">https://helios.utcluj.ro/learn2code/index.php</a> and <a href="https://biblioteca.utcluj.ro/files/carti-online-cu-coperta/679-1.pdf">https://biblioteca.utcluj.ro/files/carti-online-cu-coperta/679-1.pdf</a></p> <p>Other information: Assessment, supplementary support from: <a href="https://helios.utcluj.ro/learn2code/index.php">https://helios.utcluj.ro/learn2code/index.php</a></p> <p><b>Other libraries:</b></p> <p>7. Mircea-Florin Vaida, Petre Gavril Pop, Cosmin Strilețchi, Ligia-Domnica Chiorean, Lenuța Alboai, Programarea în limbajul C/C++. Algoritmi de bază în C/C++, Editura: Casa Cărții de Știință, Cluj-Napoca, 2011</p> <p>8. Ligia-Domnica Chiorean, Kuderna-Iulian Bența, Mircea-Florin Vaida, Petre Gavril Pop, Cosmin Strilețchi, Elemente practice de bază pentru programarea în limbajul C/C++ - editia a doua adaugita si revizuita, Casa Cartii de Stiinta, Cluj-Napoca, 2013</p> |              |                  |         |

# **10. Alignment of the course contents with the expectations of the epistemic community, professional associations, and representative employers in the field related to the program**

The course content and the teaching-learning-assessment methods are aligned with the current requirements of the Electronics, Telecommunications, and Information Technology Engineering field, considering the expectations of the academic and professional community, representative employers, as well as the national quality assurance standards in higher education. The course helps prepare students in line with employer expectations and the quality requirements set for engineering study programs.

## **11. Assessment**

| Activity type                                               | 11.1 Assessment criteria                                                                              | 11.2 Assessment methods<br>(and type of assessment:<br>continuous/ summative) | 11.3 Weight<br>in final grade |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------|
| 11.4 Lecture                                                | Theoretical (T) written and oral test with questions/code                                             | Written/oral test (T=33%)<br>continuous                                       | T = 33%                       |
| 11.5 Seminar/<br>Laboratory/ Project<br>/Practical activity | Solving a problem P on a computer (1 hour). Laboratory L will also be evaluated as activity and tests | Lab. evaluations and<br>computer test (P=34%,<br>L=33%), continuous           | P+L = 67%                     |
| 11.6 Minimum performance standard                           |                                                                                                       |                                                                               |                               |

The final grade (N) is calculated as average of marks obtained in the evaluation of ongoing activities and application type:  $N = (T + L + P) / 3.0$ . The condition for obtaining the ECTS credits is that N and all components of the final grade to be higher than or equal to 5 (five).

| Completion date: | Course coordinators | teaching rank, title First name<br>LAST NAME | Signature |
|------------------|---------------------|----------------------------------------------|-----------|
| 23.06.2026       | Lecture             | Professor, PhD Eng. Mircea-Florin Vaida      |           |
|                  | Applications        | Professor, PhD Eng. Mircea-Florin Vaida      |           |
|                  |                     | Assoc. Prof. PhD Eng. Cosmin Strilechi       |           |
|                  |                     | Assistant Prof. PhD Eng. Eusebiu Jecan       |           |

Approval of the Head of the Department coordinating the course, only if this differs from the department organizing the study program

Head of the Communications  
Department  
Prof. Virgil DOBROTĂ, Ph.D.

Date of approval by the Council of the Department of  
Bases of Electronics

Head of the Bases of Electronics  
Department  
Prof. Sorin HINTEA, Ph.D.

26.06.2026

Date of approval by the Council of the Faculty of Electronics,  
Telecommunications and Information Technology

Dean,  
Prof. Ovidiu-Aurel POP, Ph.D.

30.06.2026