**Universitatea Naţională de Ştiinţă şi Tehnologie Politehnica Bucureşti**
**Facultatea de Electronică, Telecomunicaţii şi**
**Tehnologia Informaţiei**

# COURSE DESCRIPTION

## 1. Program identification information

| | |
|---|---|
| 1.1 Higher education institution | **National University of Science and Technology Politehnica Bucharest** |
| 1.2 Faculty | **Electronics, Telecommunications and Information Technology** |
| 1.3 Department | **Electronic Devices, Circuits and Architectures** |
| 1.4 Domain of studies | Electronic Engineering, Telecommunications and Information Technology |
| 1.5 Cycle of studies | Bachelor/Undergraduate |
| 1.6 Programme of studies | Microelectronics, Optoelectronics and Nanotechnologies |

## 2. Date despre disciplină

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2.1 Course name (ro)<br>(en) | | | | Programarea calculatoarelor şi limbaje de programare 3 - Proiect Matlab | | | |
| 2.2 Course Lecturer | | | | NA | | | |
| 2.3 Instructor for practical activities | | | | Lect. Dr. Iulian Buşu | | | |
| 2.4 Year of studies | 2 | 2.5 Semester | 1 | 2.6. Evaluation type | V | 2.7 Course regime | Op |
| 2.8 Course type | | F | 2.9 Course code | 04.F.03.A.010 | | 2.10 Tipul de notare | Nota |

## 3. Total estimated time (hours per semester for academic activities)

| | | | | | |
|---|---|---|---|---|---|
| 3.1 Number of hours per week | 1 | Out of which: 3.2 course | 0.00 | 3.3 seminary/laboratory | 1 |
| 3.4 Total hours in the curricula | 14 | Out of which: 3.5 course | 0 | 3.6 seminary/laboratory | 14 |
| Distribution of time: | | | | | hours |
| Study according to the manual, course support, bibliography and hand notes<br>Supplemental documentation (library, electronic access resources, in the field, etc)<br>Preparation for practical activities, homework, essays, portfolios, etc. | | | | | 9 |
| Tutoring | | | | | 0 |
| Examinations | | | | | 2 |
| Other activities (if any): | | | | | 0 |

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|---|---|
| 3.7 Total hours of individual study | 11.00 |
| 3.8 Total hours per semester | 25 |
| 3.9 Number of ECTS credit points | 1 |

## 4. Prerequisites (if applicable) (where applicable)

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|---|---|
| 4.1 Curriculum | Computer programming.<br>Object-oriented programming. |

| | |
|---|---|
| 4.2 Results of learning | Basic knowledge of installing programs, using text editors to write code, and creating computer programs |

**5. Necessary conditions for the optimal development of teaching activities** (where applicable)

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|---|---|
| 5.1 Course | The session will take place in a room equipped, preferably, with a video projector and internet access (to allow simultaneous conduct as a Teams-type videoconference). Students can work on their own computers. |
| 5.2 Seminary/ Laboratory/Project | Attendance at sessions is mandatory (according to the Bachelor's study regulations). Students may work on their own computers during the sessions, in rooms with internet access. |

**6. General objective** *(Reffering to the teachers' intentions for students and to what the students will be thought during the course. It offers an idea on the position of course in the scientific domain, as well as the role it has for the study programme. The course topics, the justification of including the course in the currcula of the study programme, etc. will be described in a general manner)*

The course's general objective is to familiarize students with the Matlab programming language and modern related technologies often used in practice.

During project hours, students will become familiar with basic and advanced elements of the Matlab programming language, on the student's computer. The study of Matlab will combine teaching concepts with the student performing exercises individually on their personal computer, identifying and practicing the skills needed to model real-world situations on the computer.

Based on the knowledge accumulated from this course, the future electronics engineer will be able to implement or modify programs or command-line scripts specific to modern, scriptable and automatable software development and testing activities, being capable of carrying out programs from requirements specification to execution, debugging and interpretation of results.

**7. Competences** *(Proven capacity to use knowledge, aptitudes and personal, social and/or methodological abilities in work or study situations and for personal and proffesional growth. They refflect the empolyers requirements.)*

| | |
|---|---|
| **Specific Competences** | **C3.** Applying basic knowledge, concepts and methods regarding computer system architecture, microprocessors, microcontrollers, programming languages and techniques. |
| **Transversal (General) Competences** | **CT1.** Methodical analysis of problems encountered in activity, identifying the elements for which established solutions exist, thus ensuring the fulfillment of professional tasks.<br>**CT3.** Adapting to new technologies, professional and personal development through continuous training using printed documentation sources, specialized software, and electronic resources in Romanian and at least one internationally used language. |

**8. Learning outcomes** *(Synthetic descriptions for what a student will be capable of doing or showing at the completion of a course. The learning outcomes reflect the student's acomplishments and to a lesser extent the teachers' intentions. The learning outcomes inform the students of what is expected from them with respect to performance and to obtain the desired grades and ECTS points. They are defined in concise terms, using verbs similar to the examples below and indicate what will be required for evaluation. The*

*learning outcomes will be formulated so that the correlation with the competences defined in section 7 is highlighted.)*

| | |
|---|---|
| **Knowledge** | *The result of knowledge aquisition through learning. The knowledge represents the totality of facts, priciples, theories and practices for a given work or study field. They can be theoretical and/or factual.*<br>Is able to answer a series of questions based on a portfolio of activities carried out during the semester, as part of an oral examination.<br>Describes the program written in Matlab needed to solve a given problem.<br>Highlights the need to use modules.<br>Describes concepts in the Matlab language required to solve a given problem. |
| **Skills** | *The capacity to apply the knowledge and use the know-how for completing tasks and solving problems. The skills are described as being cognitive (requiring the use of logical, intuitive and creative thinking) or practical (implying manual dexterity and the use of methods, materials, tools and intrumentation).*<br>Models, programs, debugs, and successfully runs a program in order to obtain the solution to a given problem.<br>Implements a program with specified features, in Matlab.<br>Checks and debugs the validity of a given program.<br>Uses control-flow statements, Boolean expressions, functions, and modules appropriately for problem solving. |
| **Responsability and autonomy** | *The student's capacity to autonomously and responsably apply their knowledge and skills.*<br>The learner’s ability to apply autonomously and responsibly their knowledge and skills.<br>Demonstrates receptiveness to new learning contexts.<br>Reviews project materials in advance, to the extent that they are provided. In case of absence, independently goes through the taught material made available.<br>Solves homework individually and autonomously, respecting academic ethics.<br>Respects the principles of academic ethics by individually carrying out the activities marked as such and correctly citing the bibliographic sources used, if the situation requires it.<br>Applies principles of ethics/professional deontology in analyzing the technological impact of proposed solutions in the specialty field on the environment. |

**9. Teaching techniques** *(Student centric techniques will be considered. The means for students to participate in defining their own study path, the identification of eventual fallbacks and the remedial measures that will be adopted in those cases will be described.)*

The teaching materials used are the notes and presentations from the sessions, also available in electronic format.

Starting from the analysis of students’ learning characteristics and their specific needs, the teaching process will explore expository methods (lecture, presentation), problematization, and conversational-interactive methods, based on action-based learning models such as exercises, practical activities, and problem solving. Interactivity with students will be ensured through the associated applied component. Time slots are reserved for presenting, analyzing, and solving practical problems (modeling reality).

For the applied component, teaching is based on the expository method (covering the communication and demonstrative functions). Dialogue is also used during the applied sessions. These are necessary to prepare students for homework and ongoing verification tests.

Feedback will also be used as a way to adapt the pedagogical approach to students’ learning needs.

**10. Contents**

| **PROJECT** | | |
|---|---|---|
| **Crt. no.** | **Content** | **No. hours** |
| 1 | Introduction to MATLAB and basic functionalities | 1 |
| 2 | Data types and matrix operations | 1 |
| 3 | Decision structures and loops | 1 |
| 4 | User-defined functions and code reuse | 1 |
| 5 | 2D plots and data visualization | 1 |
| 6 | File handling and input/output in MATLAB | 1 |
| 7 | String and cell array manipulation | 1 |
| 8 | Numerical simulations and optimization | 1 |
| 9 | Signal analysis and data processing | 1 |
| 10 | Integration and solving differential equations | 1 |
| 11 | Modeling and simulation: practical applications | 1 |
| 12 | Development and testing of a complex algorithm | 1 |
| 13 | Creating graphical user interfaces (GUI) in MATLAB | 1 |
| 14 | Project presentations and final discussions | 1 |
| | **Total:** | 14 |
| **Bibliography:** | | |

**11. Evaluation**

| Activity type | 11.1 Evaluation criteria | 11.2 Evaluation methods | 11.3 Percentage of final grade |
|---|---|---|---|
| 11.4 Course | | | |
| 11.5 Seminary/laboratory/project | Correct identification of theoretical and practical contexts for applying the studied concepts related to the MATLAB programming language. | The applied activity is continuously checked throughout the semester. Homework. | 30% |
| | The ability to model and successfully solve a project assignment in MATLAB | Final oral evaluation based on the development of the project assignment. | 70% |
| 11.6 Passing conditions | | | |
| Implementation in Matlab of a program that solves a specific problem; modeling, programming, successful execution for obtaining the solution.<br>Obtaining 50% of the total score or the minimum score provided by the regulations. | | | |

**12. Corroborate the content of the course with the expectations of representatives of employers and representative professional associations in the field of the program, as well as with the current state of knowledge in the scientific field approached and practices in higher education institutions in the European Higher Education Area (EHEA)**

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MATLAB is a high-level programming language and an interactive environment developed by MathWorks, intended mainly for numerical analysis, matrix computation, algorithm development, data visualization, and system simulation. The language is oriented toward matrix processing and offers powerful tools for solving complex scientific and engineering problems. It is a very popular programming language in the target fields of our graduates (automation, telecommunications, signal processing, image processing, modeling and simulation, finance, and artificial intelligence), both in research and industry, as well as in academia.

Given that it is a very popular programming language in the target fields of our graduates, with the help of this course the future electronics engineer will be able to implement or modify programs or scripts specific to research, design, development, and testing activities.

Based on the knowledge accumulated by completing this course, the future electronics engineer will be able to implement or modify command-line programs or scripts specific to research, design, development, and testing activities.

| Date | Course lecturer | Instructor(s) for practical activities |
|---|---|---|
| 25.09.2025 | NA | Lect. Dr. Iulian Bușu |

| Date of department approval | Head of department |
|---|---|
| 26.09.2025 | Prof. Dr. Claudius Dan |

| Date of approval in the Faculty Council | Dean |
|---|---|
| 26.09.2025 | Prof. Dr. Mihnea Udrea |