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

# COURSE DESCRIPTION

## 1. Program identification information

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|---|---|
| 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 | Applied Electronics |

## 2. Date despre disciplină

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|---|---|---|---|---|---|---|---|
| 2.1 Course name (ro)<br>(en) | | | | Informatică aplicată - Proiect<br>Applied Informatics - Project | | | |
| 2.2 Course Lecturer | | | | As. Andrei-Alexandru Ulmămei | | | |
| 2.3 Instructor for practical activities | | | | As. Andrei-Alexandru Ulmămei | | | |
| 2.4 Year of studies | 1 | 2.5 Semester | II | 2.6. Evaluation type | V | 2.7 Course regime | Ob |
| 2.8 Course type | | F | 2.9 Course code | 04.F.02.O.015 | | 2.10 Tipul de notare | Nota |

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

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|---|---|---|---|---|---|
| 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 | 14.00 | 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. | | | | | 30 |
| Tutoring | | | | | 3 |
| Examinations | | | | | 3 |
| Other activities (if any): | | | | | 0 |

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| 3.7 Total hours of individual study | 36.00 |
| 3.8 Total hours per semester | 50 |
| 3.9 Number of ECTS credit points | 2 |

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

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| 4.1 Curriculum | Computer Programming and Programming Languages 1 |
| 4.2 Results of learning | General C/C++ programming knowledge. |

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

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| 5.1 Course | Not Applicable |
| 5.2 Seminary/ Laboratory/Project | Room fitted with computers, ESP32 boards and soldering equipment. |

**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)*

This projects aims to to deepen and apply the knowledge and abilities gained through other programming course in the form of a practical project that combines programming, hardware ocmponents and communication protocols. Students are encouraged to explore multiple functions of the ESP32 board through a wide variety of projects, as well as implementing their own hardware+software solutions.

**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.)*

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| **Specific Competences** | Creation of abilities and competencies in the field of microcontrollers and their practical usage. Ability to evaluate (based on performance and architectural criteria) microcontroller selection and usage in response to a real life problem. |
| **Transversal (General) Competences** | Honourable, ethical, responsible behaviour, in the spirit of the law. |

**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.)*

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|---|---|
| **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>Physical applications will be created by the students, both in hardware and in software. Proposed projects and themes are given in order to help students discover multiple areas of electronic design. |
| **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>Capacity to apply knowledge gained from programming courses in developing a fully functional project. Capacity to write clear and expressive documentation regarding their work. Capacity to present their work and obtained results. |

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| **Responsability and autonomy** | *The student's capacity to autonomously and responsably apply their knowledge and skills.*<br>Time and resource management, teamwork and result synthesis abilities. |

**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.)*

Oral, frontal presentation, the problematiozation technique. Students simulate, test and evaluate independently the proposed problems, by means of computer and software environment.

**10. Contents**

| **PROJECT** | | |
|---|---|---|
| **Crt. no.** | **Content** | **No. hours** |
| 1 | ESP32 board and Arduino environment presentations. Installing sodtware and libraries. A simple "Blinky" test program. | 2 |
| 2 | Presentation of electronical interconnection. Combining hardware and software. Selection of project theme. | 2 |
| 3 | Presentation of more complex projects using ESP32. Examples. | 2 |
| 4 | WiFi and Bluutooth communication protocols presentations, as available on the ESP32 board. Example applications using these protocols. | 2 |
| 5 | Design and implementation of a complete hardware+software project using previously accumulated knowledge. Examples. | 2 |
| 6 | Consultations regarding the main project implementations. | 2 |
| 7 | Final evaluation. | 2 |
| | **Total:** | |

**Bibliography:**

1. Project guide found of Moodle or Teams.
2. https://www.espressif.com/sites/default/files/documentation/esp32_technical_reference_manual_en.pdf
3. Electronics Projects with the Esp8266 and Esp32: Building Web Pages, Applications, and Wifi Enabled Devices, Paperback - Neil Cameron, Ed. Apress, 2020

**11. Evaluation**

| Activity type | 11.1 Evaluation criteria | 11.2 Evaluation methods | 11.3 Percentage of final grade |
|---|---|---|---|
| 11.4 Course | | | |

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|---|---|---|---|
| 11.5 Seminary/laboratory/project | Laboratory tasks or homework | Oral evaluation | 20 |
| | Final project hardware component | Oral evaluation and practical demonstration | 20 |
| | Final project software component | Oral evaluation and practical demonstration | 20 |
| | Knowledge gained, questions answered | Oral evaluation | 20 |
| | Project documentation | Structure, conciseness, rigurosity and logic, regarding documentation and project presentation. | 20 |
| 11.6 Passing conditions | | | |
| Obtaining a minimum of 50% of the total points.<br>Obtaining a minimum of 50% of the "Knowledge gained, questions answered" category.<br>Functional implementation of the designated project using the ESP32 board. | | | |

**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)**

In order to maintain the rhythm of software and hardware product development, the industrial environment requires a constant influx of qualified engineers, trained in using microcontrollers and with a solid background of fundamental electronics.

This project's curriculum is a direct response to modern requirements regarding electronic system design. In the context of current technological progress in the field of microcontroller systems, application domains are practically limitless. It thus helps students obtain the scientific training and necessary qualifications to easily allow them to get hired in application development positions. This project is perfectly situated within the Bucharest Politechnica University, from both the content point of view, and the developed skills point of view.

| Date | Course lecturer | Instructor(s) for practical activities |
|---|---|---|
| 21.09.2026 | | As. Andrei-Alexandru Ulmămei |

Date of department approval — Head of department

Date of approval in the Faculty Council Dean