Universitatea Națională de Știință și Tehnologie Politehnica București
Facultatea de Electronică, Telecomunicații și
Tehnologia Informației

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 Technology and Reliability**
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) (en)				Informatică aplicată - Proiect Applied Informatics - Project			
2.2 Course Lecturer							
2.3 Instructor for practical activities				S.l. Dr. Ing. Valentin-Gabriel Voiculescu, S.l. Dr. Ing. Iulian Busu			
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)

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 Supplemental documentation (library, electronic access resources, in the field, etc) Preparation for practical activities, homework, essays, portfolios, etc.					34
Tutoring					0
Examinations					2
Other activities (if any):					0

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)

4.1 Curriculum	Computer Programming and Programming Languages 1
4.2 Results of learning	General knowledge of procedura and object oriented programming în C/C++ languages

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

5.1 Course	Not applicable
5.2 Seminary/ Laboratory/Project	Room with computers and ESP32 development boards

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 overall objective of the project is to deepen the knowledge acquired in programming courses and to apply this knowledge in a practical project that combines the software side with hardware components and communication protocols. Students are encouraged to explore the functionality of the ESP32 development board by experimenting with different peripherals, practicing the works proposed by the teacher and project themes by combining software and hardware elements (including by putting their own ideas into practice).

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	Creating the skills to apply general knowledge regarding the architectural attributes of microcontrollers for various projects. The possibility to evaluate based on the acquired performance criteria which particular processor and in what manner it can be used for an efficient solution of specific problems (competences C1, C2, C3 from the evaluation grid).
Transversal (General) Competences	Honorable, responsible, ethical behavior, in the spirit of the law to ensure the reputation of the profession.

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.* Concrete applications will be developed in which students will be involved in both the software and hardware development, where necessary. The proposed projects aim to provide an overview of the fields that students will study in detail in college.
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).* The ability to put into practice and apply the concepts acquired in programming courses to create a functional project. The ability to create documentation, following a specified structure. The ability to present the results obtained in an open and constructive environment.

Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Time and resource management, ability to work in a team and synthesize results for presentation

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 oral communication method used is the exhibition method and the problematization method, used face-to-face. Students simulate, implement, test and evaluate the same problems independently through the continuous use of the computer and the software environment. The teaching materials are the project platforms included in the project guide.

10. Contents

PROJECT		
Crt. no.	**Content**	**No. hours**
1	Introduction to the ESP32 development board, Arduino IDE/Visual Studio Code and simulator. Installation of the required software and dependencies. Troubleshooting the installation. Introduction to possible themes. Using the serial monitor and lighting an LED in a real or simulated environment.	2
2	Practicing interaction with the serial monitor and lighting up some LEDs. Using a breadboard. Practicing soldering with solder. LED bargraph. Consultation on homework and final project.	2
3	LED bargraph validation. Bluetooth / Bluetooth Low Energy communication. Advantages and limitations. Examples. Consultation on homework and final project.	2
4	Interaction with displays (e.g. 7-segment module). WiFi communication. Advantages and limitations. Examples. Consultation on homework and final project.	2
5	Advanced aspects of Bluetooth/Wi-Fi communication. AT commands. CRC codes. Consultation on homework and final project.	4
6	Final evaluation	2
	Total:	14

Bibliography:

1. Platform materials loaded onto Moodle/Teams or/and other media.
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, 2021

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	Homework assignments during the semester and related documentation. Gradual documentation of the final project.	Evaluation during the semester	80
	Creating and presenting the project application	Oral evaluation and practical demonstration	20
11.6 Passing conditions			
Obtaining a minimum of 50% of the total grade. Ensuring a minimum level of understanding of the steps and programming method of a development board, the use of a simulator, the implementation of a project with hardware and software components.			

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)

The course provides students with an introduction to the main areas studied in the faculty: hardware, software and communications, through practical, functional examples that combine design and programming aspects together with testing aspects widely used in industry. The industry has a significant demand for qualified engineers, with specializations related to the use of microcontrollers and with a solid foundation in electronics, systems and information technology, so that the pace of development of new hardware products and software applications can be maintained.

The project curriculum responds concretely to these current requirements for development and evolution, at the national and european level. In the context of the current technological progress of electronic devices, the areas of activity targeted are practically unlimited, from the field of electronics and telecommunications, the military field, the field of security (surveillance systems), the field of industrial automation (product inspection systems), robotics (human-machine interface systems) and others.

This ensures that graduates have skills appropriate to the needs of current qualifications and a modern scientific and technical training, of competitive quality on the labor market, which allows them to be quickly employed after graduation, being perfectly aligned with the policy of the National University of Science and Technology Politehnica Bucharest, both in terms of content and structure, and in terms of the skills and international openness offered to students.

Date Course lecturer Instructor(s) for practical activities

S.l. Dr. Ing. Valentin-Gabriel Voiculescu

S.l. Dr. Ing. Iulian Busu

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Date of department approval	Head of department Assoc.Prof.Phd.Eng. Marian VLĂDESCU
Date of approval in the Faculty Council	Dean Prof. Phd. Eng. Radu Mihnea UDREA