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	**Telecommunications**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Masters
1.6 Programme of studies	Advanced Wireless Communications

2. Date despre disciplină

2.1 Course name (ro) (en)				Proiect de cercetare integrator Integrator Research Project			
2.2 Course Lecturer				Conf. Dr. Alexandru RUSU			
2.3 Instructor for practical activities				Conf. Dr. Alexandru RUSU			
2.4 Year of studies	2	2.5 Semester	I	2.6. Evaluation type	V	2.7 Course regime	Ob
2.8 Course type		DS	2.9 Course code	UPB.04.M3.O.21-25		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	NA
4.2 Results of learning	NA

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

5.1 Course	NA
5.2 Seminary/ Laboratory/Project	The applications will take place in a room equipped with computer systems, the necessary software, 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)*

In this Integrated Research project, students will familiarize themselves with the requirements for writing a research document, by choosing a theme proposed by the teaching staff. Thus, the students will have elaborated a bibliographic study and an implementation activity on a given topic, in the field of technologies used in telecommunications.

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	Demonstrate advanced knowledge of telecommunications networks. Correlates knowledge of networks, protocols, algorithms and communication systems. Apply field-specific knowledge in practice. Apply standardized methods and tools to carry out the evaluation and diagnosis process of a situation, depending on the identified/reported problems, and identify solutions. Argue and analyze coherently and correctly the context of application of advanced knowledge of the field, using key concepts of the discipline and specific methodology.
Transversal (General) Competences	The student works in a team and communicates effectively, coordinating his efforts with others to solve problem situations of medium complexity. Autonomy and critical thinking: the ability to think in scientific terms, search and analyze data independently, and draw and present conclusions/identify solutions. Analytical and synthesis capacity: presents the acquired knowledge in a synthetic way, leading to a systematic analysis process. Respects the principles of academic ethics: correctly cite the bibliographic sources used in the documentation activity. Put into practice elements of emotional intelligence in the appropriate social-emotional management of real-life/academic/professional situations, demonstrating self-control and objectivity in decision-making or stressful situations. He can assume roles / functions of managing the activity of groups, teams or projects.

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.* Lists the most important stages that marked the development of the field. Defines domain-specific notions. Describe/classify notions/processes/phenomena/structures. It highlights consequences and relationships.
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).* Selects and groups relevant information in a given context.· Arguably uses specific principles in the field of wireless communications, IoT· Work productive in team.· Elaborate a scientific text.· Experimentally verify identified solutions.· Solve practical application.·Interpret and appropriate causal relationships.· Analyze and compare performance for solutions offered in practice.· Identify solutions and drafts solution plans/projects.· Formulate conclusions to the experiments carried out. Argues identified solutions/workarounds.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Select suitable bibliographic sources and analyzes them.· Respect the principles of academic ethics, correctly citing the bibliographic sources used.· Demonstrate responsiveness for new learning contexts.· Show collaboration with other colleagues and teaching staff in carrying out teaching activities· Demonstrate autonomy in the organization of the learning situation/context or the problem situation to be solved· Promotes/contributes through new solutions related to the specialized field to improve the quality of social life.· He realizes the value of his contribution to the field of engineering to the identification of viable/sustainable solutions to solve problems in social and economic life (social responsibility). Analyze and capitalize on business opportunities, of entrepreneurial development in the specialty field.

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.)*

Starting from the analysis of the students' learning characteristics and their specific needs, the teaching process will explore both expository (lecture, exposition) and conversational-interactive teaching methods, based on discovery learning models facilitated by direct exploration and indirect way of reality (experiment, demonstration, modelling), but also on action-based methods, such as exercise, practical activities and problem solving. In the teaching activity, lectures of Chip Systems in Communications will be used in the form of Power Point presentations or different videos that will be made available to the students. Each course will begin with a recapitulation of the chapters already covered, with an emphasis on the concepts covered in the last course.

Presentations use images and diagrams so that the information presented is easy to understand and assimilate.

This discipline covers information and practical activities designed to support students in their learning efforts and the development of optimal collaborative and communication relationships in a climate conducive to learning through discovery.

It will be considered the practice of active listening and assertive communication skills, as well as feedback construction mechanisms, as ways of regulating behavior in various situations and adapting the pedagogical approach to the students' learning needs.

Teamwork skills will be practiced to solve different learning tasks.

10. Contents

PROJECT		
Crt. no.	**Content**	**No. hours**
1	Defining projects and documentation methodology for the chosen topic	2
2	Establishing individual themes and research methodology	2
3	Establishing the approaches and software packages necessary for the activity inthe project	2
4	Establishing the plan of the project	2
5	Project progress tracking	2
6	Analysis of the problems encountered in the project	2
7	Project presentation	2
	Total:	14

Bibliography:

1)
David Tse, Pramod Viswanath,
Fundamentals of Wireless Communication,, Cambridge UniversityPress,2020
2)
Wolfgang Osterhage,
Wireless Network Security, CRC Press, 2018
3)
Anna Forster,
Introduction to Wireless Sensor Networks, Wiley,
4) Introduction to Engineering Research, Wendy C. Crone, Springer, 2022
5) S. Sicari, A. Rizzardi L.A. Grieco, A. Coen-Porisini, “Security and Privacy in IoT: theroadahead”,Computer Networks, Vol 76, 2015, pp. 146-164, ISSN 1389-1286,https://doi.org/10.1016/j.comnet.2014.11.008.

11. Evaluation

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

11.5 Seminary/laboratory/project	Knowledge	Project contents	60
	Presence, activity	Semester activity evaluation	20
	Finalising the project	Project presentation	20
11.6 Passing conditions			
• Fulfilling the obligations characteristic of the project activity: presenting the elaborated project. • Obtaining 50% of the score related to the activity during the semester.			

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)

Through the activities carried out, students develop skills to offer solutions to problems and to propose ideas for improving the situation of existence in the field of telecommunications networks.

• Knowledge / aspects / phenomena described in specialized literature / own research published / presented in scientific journals and conferences were taken into account in the development of the content of the discipline

• Through the activities of this discipline, the development of the student's skills in managing practical situations that he can face in real life is considered, in order to increase his contribution to the improvement of the socio-economic environment.

Date	Course lecturer	Instructor(s) for practical activities
	Conf. Dr. Alexandru RUSU	Conf. Dr. Alexandru RUSU

Date of department approval	Head of department
27.10.2024	Conf. Dr. Serban Georgica Obreja

Date of approval in the Faculty Council	Dean
25.10.2024	Prof. Dr. Mihnea Udrea

Universitatea Națională de Știință și Tehnologie Politehnica București

Facultatea de Electronică, Telecomunicații și

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