**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 | **Telecommunications** |
| 1.4 Domain of studies | Electronic Engineering, Telecommunications and Information Technology |
| 1.5 Cycle of studies | Bachelor/Undergraduate |
| 1.6 Programme of studies | Technologies and Telecommunications Systems |

## 2. Date despre disciplină

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2.1 Course name (ro)<br>(en) | | | | Comunicaţii analogice şi digitale - Laborator | | | |
| 2.2 Course Lecturer | | | | | | | |
| 2.3 Instructor for practical activities | | | | Prof. Dr. Calin Vladeanu | | | |
| 2.4 Year of studies | 4 | 2.5 Semester | 1 | 2.6. Evaluation type | V | 2.7 Course regime | Ob |
| 2.8 Course type | | S | 2.9 Course code | 04.S.07.O.206 | | 2.10 Tipul de notare | Nota |

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

| | | | | | |
|---|---|---|---|---|---|
| 3.1 Number of hours per week | 2 | Out of which: 3.2 course | 0.00 | 3.3 seminary/laboratory | 2 |
| 3.4 Total hours in the curricula | 28 | Out of which: 3.5 course | 0 | 3.6 seminary/laboratory | 28 |
| 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. | | | | | 20 |
| Tutoring | | | | | 0 |
| Examinations | | | | | 2 |
| Other activities (if any): | | | | | 0 |

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| 3.7 Total hours of individual study | 22.00 |
| 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 | Completion and/or promotion of the following courses:<br>Analog and Digital Communications; Data Communications |

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| 4.2 Results of learning | Basic knowledge about analog and digital signal processing, analog and digital modulation techniques, and electronic measuring devices |

**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 | The laboratory will take place in a classroom with specific equipment, which must include: computers, signal generators, oscilloscope, multimeters, specific measurement boards etc. |

**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 experimental works that will be performed are intended to be a natural continuation in an applicative sense, of theoretic knowledge learned in the courses: Analog and Digital Communications, Data Communications..

**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** | Design, implementation and services of data, voice, video and multimedia operation, based on understanding and applying the fundamental concepts of communication and information transmission.<br>Selection, installation and operation of fixed and mobile telecommunications equipment and network design to ensure a common telecommunications site |
| **Transversal (General) Competences** | Works in a team and communicates effectively, coordinating his efforts with others to solve problem situations of medium complexity. |

**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>List the most important steps in an analog/digital communication system.<br>Defines notions specific to analog and digital communications. |

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|---|---|
| **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>Work productively in a team.<br>Solve practical applications.<br>Analyze and compare phenomena/techniques encountered in analog/digital communication systems.<br>Formulate conclusions to the experiments carried out. |
| **Responsability and autonomy** | *The student's capacity to autonomously and responsably apply their knowledge and skills.*<br>Demonstrates responsiveness to new learning contexts.<br>Demonstrates collaboration with other colleagues and teaching staff in carrying out teaching activities. |

**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.)*

Applicative teaching will be performed through simulation of communication techniques assisted by multimedia aids and through experimental measurements conducted on the hardware implementation modules of these techniques. The whole student’s activity is monitored by a client-server Lab-Volt application, running on the computer network from the lab. The lab curriculum presenting the works is accessed using the same client-server application.

**10. Contents**

| **LABORATORY** | | |
|---|---|---|
| **Crt. no.** | **Content** | **No. hours** |
| 1 | Amplitude modulation communications (AM-DSB). Single side-band amplitude modulation communications (SSB) | 4 |
| 2 | Exponential modulation communications (PM, FM) | 4 |
| 3 | Pulse amplitude modulation communications (PAM). Pulse-width modulation communications(PWM) | 4 |
| 4 | Pulse code modulation communications (PCM). Delta modulation communications (DM) | 4 |
| 5 | Line encoding for data transmissions | 4 |
| 6 | Data transmissions using BPSK and QPSK modulations | 4 |
| 7 | Motivated remaking of some laboratory works | 4 |
| | **Total:** | 28 |

**Bibliography:**
https://curs.upb.ro/2023/course/view.php?id=10291
V. Croitoru, „Comunicaţii digitale. Teorie şi experiment”, Ediţia a II –a, Ed. Printech, Bucureşti, 2003.
I. Bănică, S. Popescu, C. Vlădeanu, C. Chisăr, “Comunicaţii de date – Îndrumar de laborator”, Editura U.P.B., 2002.
S. Halunga, O. Fratu, “Simularea sistemelor de transmisiune analogice şi digitale folosind mediul Matlab/Simulink ”, Editura Matrix Rom, Bucureşti, 2004

**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 | attendance (laboratory) | not applicable | 10 |
| | periodic testing (laboratory) | 6 multiple-choice tests; all tests have equal weight | 30 |
| | final theory and practice test | 1 theory and 1 practice test, based on the measurements they made in the laboratory | 60 |
| 11.6 Passing conditions | | | |
| Obtaining 50% of the total score. To be able to generate MA, MF, PAM, PCM signals with the equipment from the laboratory and to interpret the results obtained from the measurements. | | | |

**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 laboratory topics aim to deepen the information transmission and reception phenomena, in the context of an analog and/or digital modulation communication chain, by learning modulation and demodulation respectively, related to communications techniques to be performed in the absence or presence of noise. Knowledge transmitted ensure the training of OSI physical layer future specialists, being useful to all those who will work in the IT&C companies or academic and research institutions in the field.

| Date | Course lecturer | Instructor(s) for practical activities |
|---|---|---|
| 21.09.2026 | | Prof. Dr. Calin Vladeanu |

| Date of department approval | Head of department |
|---|---|
| 22.09.2026 | Conf. Dr. Serban Georgica Obreja |

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Date of approval in the Faculty Council

22.09.2026

Dean

Prof. Dr. Mihnea Udrea

