

## COURSE DESCRIPTION

### 1. Program identification information

|                                      |   |
|--------------------------------------|---|
| 1.1 Higher education institution     | University POLITEHNICA of Bucharest                                       |
| 1.2 Faculty                          | Electronics, Telecommunications and Information Technology                |
| 1.3 Department                       | Telecommunications  |
| 1.4 Domain of studies                | Electronic Engineering, Telecommunications and Informational Technologies |
| 1.5 Cycle of studies                 | License   |
| 1.6 Program of studies/Qualification | Technologies and Systems of Telecommunications (TSTeng)                   |

### 2. Course identification information

|   |    |              |   |  |               |                        |            |
|---|----|--------------|---|--|---------------|------------------------|------------|
| 2.1 Name of the course                  |    |              |   | Analog and Digital Communications - Laboratory |               |                        |            |
| 2.2 Lecturer                            |    |              |   | Prof. PhD Eng. Octavian Fratu                  |               |                        |            |
| 2.3 Instructor for practical activities |    |              |   | Lect. PhD Eng. Carmen Voicu ;                  |               |                        |            |
| 2.4 Year of studies                     | IV | 2.5 Semester | 7 | 2.6 Evaluation type                            | Verificatio n | 2.7 Course choice type | Compulsory |

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

|  |    |            |   |                          |       |
|--|----|------------|---|--------------------------|-------|
| 3.1 Number of hours per week, out of which   | 2  | 3.2 course | - | 3.3 practical activities | 2     |
| 3.4 Total hours in the curricula, out of which                                       | 28 | 3.5 course | - | 3.6 practical activities | 28    |
| Distribution of time   |    |            |   |                          | hours |
| Study according to the manual, course support, bibliography and hand notes           |    |            |   |                          | 17    |
| Supplemental documentation (library, electronic access resources, in the field, etc) |    |            |   |                          | 2     |
| Preparation for practical activities, homeworks, essays, portfolios, etc.            |    |            |   |                          | 2     |
| Tutoring   |    |            |   |                          | 0     |
| Examinations   |    |            |   |                          | 3     |
| Other activities   |    |            |   |                          | 0     |
| 3.7 Total hours of individual study  |    | 24         |   |                          |       |
| 3.9 Total hours per semester   |    | 52         |   |                          |       |
| 3.10 Number of ECTS credit points  |    | 2          |   |                          |       |

#### 4. Prerequisites (if applicable)

|                      |   |
|----------------------|---|
| 4.1 curricular       | Analog and Digital Communications;<br>Data Communications.  |
| 4.2 competence-based | Basic knowledge about analog and digital signal processing, analog and digital modulation techniques, and electronic measuring devices. |

#### 5. Requisites (if applicable)

|                                     |   |
|-------------------------------------|---|
| 5.1 for running the course          | Not Applicable                                |
| 5.2 for running of the applications | Under regulation undergraduate studies in UPB |

#### 6. Specific competences

|                          |   |
|--------------------------|---|
| Professional 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. Selection, installation and operation of fixed and mobile telecommunications equipment and network design to ensure a common telecommunications site. |
| Transversal competences  | -   |

#### 7. Course objectives (as implied by the grid of specific competences)

|                                     |   |
|-------------------------------------|---|
| 7.1 General objective of the course | The experimental works that will be performed are intended to be a natural continuation in an applicative sense, of theoretic knowledge learned in the framework of disciplines: Analog and Digital Communications, Data Communications.  |
| 7.2 Specific objectives             | Applications aim to familiarize the students with the implementation of analog and digital transmission techniques using dedicated hardware equipments (LabVolt test boards). Mainly, it is aimed to familiarize the students with:<br>- analog modulation techniques (AM, PM, FM);<br>- pulse modulation techniques (PAM, PCM, DM);<br>- phase-shift modulation techniques (BPSK, QPSK). |

#### 8. Content

| 8.1 Lectures | Teaching techniques | Remarks |
|--------------|---------------------|---------|
| Bibliography |                     |         |

| 8.2 Practical applications   | Teaching techniques  | Remarks |
|--|--|---------|
| Amplitude modulation communications (AM-DSB)   | 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. | 4 hours |
| Single side-band amplitude modulation communications (SSB)   |  | 2 hours |
| Exponential modulation communications (PM, FM)   |  | 4 hours |
| Pulse amplitude modulation communications (PAM)  |  | 2 hours |
| Pulse code modulation communications (PCM)   |  | 2 hours |
| Delta modulation communications (DM)   |  | 2 hours |
| Multiplexed transmissions. The primary multiplex   |  | 4 hours |
| Data transmissions using BPSK modulation   |  | 2 hours |
| Data transmissions using QPSK modulation   |  | 2 hours |
| Line encoding for data transmissions   |  | 2 hours |
| Motivated remaking of some laboratory works  |  | 2 hours |
| <b>Bibliography</b><br>1. V. Croitoru (coordonator), „Comunicații digitale. Teorie și experiment”, Ediția a II –a, Ed. Printech, București, 2003.<br>2. I. Bănică, S. Popescu, C. Vlădeanu, C. Chisăr, “Comunicații de date – Îndrumar de laborator”, Editura U.P.B., 2002.<br>3. S. Halunga, O. Fratu, “Simularea sistemelor de transmisiune analogice și digitale folosind mediul Matlab/Simulink ”, Editura Matrix Rom, București, 2004 |  |         |

### **9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program**

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.

## 10. Evaluation

| Type of activity   | 10.1 Evaluation criteria  | 10.2 Evaluation methods   | 10.3 Weight in the final mark |
|--|---|---|-------------------------------|
| 10.4 Lectures  | -   | -   | -                             |
|  | -   | -   | -                             |
| 10.5 Laboratory  | - attendance (laboratory)<br>- periodic testing (laboratory)<br><br>- final practice test | 6 multiple-choice tests (one test every 2 weeks); all tests have equal weight | 10%<br><br>20%<br><br>70%     |
| 10.6 Minimal performance standard  |   |   |                               |
| - The deepening of real problems occurring during structural analysis generation and detection in the context of a transmission chain;<br>- Functionality implementation and demonstration of common solutions applied in the analog and / or digital transmissions. |   |   |                               |

Date  
11.09.2017

Lecturer  
Prof.PhD. Eng. Octavian Fratu

Instructor for practical activities  
Lect..PhD. Eng.Carmen Voicu



.....



.....

.....

Date of department approval  
25.09.2017

Director of Department,  
Assoc. Prof.PhD. Eng.Eduard POPOVICI



.....

.....