

# COURSE DESCRIPTION

## 1. Program identification information

|                                      |   |
|--------------------------------------|---|
| 1.1 Higher education institution     | Politehnica University of Bucharest                                   |
| 1.2 Faculty                          | Faculty of Electronics, Telecommunications and Information Technology |
| 1.3 Department                       | Telecommunications  |
| 1.4 Domain of studies                | Computers and Information Technology                                  |
| 1.5 Cycle of studies                 | Licence (engineering)   |
| 1.6 Program of studies/Qualification | Technologies and Systems of Telecommunications - English              |

## 2. Course identification information

|   |    |              |   |                              |              |                        |           |
|---|----|--------------|---|------------------------------|--------------|------------------------|-----------|
| 2.1 Name of the course                  |    |              |   | Signals and Programming (SP) |              |                        |           |
| 2.2 Lecturer                            |    |              |   | -                            |              |                        |           |
| 2.3 Instructor for practical activities |    |              |   | As. Drd. Ing. Valentin Niță  |              |                        |           |
| 2.4 Year of studies                     | II | 2.5 Semester | I | 2.6 Evaluation type          | Verification | 2.7 Course choice type | Mandatory |

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

|  |    |            |   |                          |       |
|--|----|------------|---|--------------------------|-------|
| 3.1 Number of hours per week, out of which   | 1  | 3.2 course | 0 | 3.3 practical activities | 1     |
| 3.4 Total hours in the curricula, out of which                                       | 14 | 3.5 course | 0 | 3.6 practical activities | 14    |
| Distribution of time   |    |            |   |                          | hours |
| Study according to the manual, course support, bibliography and hand notes           |    |            |   |                          | 0     |
| Supplemental documentation (library, electronic access resources, in the field, etc) |    |            |   |                          | 3     |
| Preparation for practical activities, homeworks, essays, portfolios, etc.            |    |            |   |                          | 8     |
| Tutoring   |    |            |   |                          | 0     |
| Examinations   |    |            |   |                          | 1     |
| Other activities   |    |            |   |                          | 0     |
| 3.7 Total hours of individual study  |    |            |   |                          | 12    |
| 3.9 Total hours per semester   |    |            |   |                          | 26    |
| 3.10 Number of ECTS credit points  |    |            |   |                          | 1     |

## 4. Prerequisites (if applicable)

|                      |  |
|----------------------|--|
| 4.1 curricular       | Computer programming<br>Data structures and algorithms<br>Special Mathematics      |
| 4.2 competence-based | General programming knowledge. General mathematics and usual transforms knowledge. |

### 5. Requisites (if applicable)

|                                     |  |
|-------------------------------------|--|
| 5.1 for running the course          | Not applicable, according to current PUB regulations.                        |
| 5.2 for running of the applications | Mandatory presence at project classes, according to current PUB regulations. |

### 6. Specific competences

|                          |   |
|--------------------------|---|
| Professional competences | C3. Application of knowledge, concepts and basic methods that refer to the computer systems, microcontrollers, programming languages and techniques<br>C4. Designing, implementing and operating of data, voice, video and multimedia services based on the understanding and applying of fundamental concepts from communications and information technology domains |
| Transversal competences  | It is not the case  |

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

|                                     |  |
|-------------------------------------|--|
| 7.1 General objective of the course | The course introduces the students to general technics used for signal processing and the implementation of them using Matlab.   |
| 7.2 Specific objectives             | The specific objectives of the course are related to the acquisition of knowledge and abilities related to:<br>- familiarization of the students with frequency signals analyzing;<br>- frequency signals multiplexing using modulation;<br>- programing technics specific to signals. |

### 8. Content

| 8.1 Project   | Teaching techniques  | Remarks |
|---|--|---------|
| Introduction to Matlab (students are familiarized with the matrix working mode of Matlab).  | Teaching is based on the usage of videoprojection (for communication and demonstration); the oral communication is based on frontal exposition and problems.<br>The course materials are the course notes and handouts and proposed exercises (both theoretical and computer-based). All materials are available in electronic form via the course site. | 2 hours |
| Fourier series computation (Implementing of functions used for obtaining the Fourier coefficients for periodic signals). Fourier Transform.               |  | 2 hours |
| Introduction to graphical programming using Simulink. Usual operations applied to signals (generating, sum, product, visualization). Amplitude modulation |  | 2 hours |

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| simulating using Simulink.   |  |         |
| Fourier transform for analog signals   |  | 2 hours |
| Laplace transform for analog signals.<br>Analog systems applications.  |  | 2 hours |
| Discrete signals. Z transform.   |  | 2 hours |
| Final project presentation   |  | 2 hours |
| <b>Bibliography</b><br>1) Dalmaso, R., Witomski, P., Analyse de Fourier et Applications, Exercices corrigés, Masson, Paris 1996.<br>2) Haykin, S., Van Veen, B., Signals and Systems, J. Wiley, Chichester, 1999.<br>3) Yang, Won Young “Signals and Systems with MATLAB”, Springer 2009<br>4) Luis Chaparro “Signals and Systems using MATLAB”, Second Edition , Academic Press 2014<br>5) <a href="http://www.mathworks.com">http://www.mathworks.com</a><br>6) Notes Signals and Systems, Prof. Dr. Ing. Dumitru Stanomir |  |         |

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

Matlab is one of the most used programming environments used for signals processing and not only. This uses a high level language, contains dedicated toolboxes for different applications (signal processing, statistics, etc.), making possible to implements algorithms very easy. Matlab programming represents the bases of electronics engineering, telecommunications and informational technologies. The projects links signals theory and the practical applicability trough Matlab making a clear image for the students of the need for understanding the signals theory in electronics and telecommunication, programming being a base instrument for implementing solutions in this area.

The course content reply to the actual demands of innovations and evolution subscribed to the UE economy of services from Applied Electronics. Because of the actual electronic devices technological context the activity areas are practically unlimited: signal acquisition, digital photo cameras, smartphones, telecommunications, military field, security field, robotics and others.

This way the students are developing abilities proper to the actual needs of the working market and benefits of scientifically preparation and modern technics, which can facilitate a job after graduation, the discipline is perfectly linked to the politics of the University Politehnica of Bucharest.

**10. Evaluation**

| Type of activity | 10.1 Evaluation criteria  | 10.2 Evaluation methods  | 10.3 Weight in the final mark |
|------------------|---|--|-------------------------------|
| 10.4 Project     | - knowledge of the fundamental theoretical notions;<br>- knowledge of the | After every meeting the students have as homework a mini-project to be implemented based | 80%                           |

|   |   |  |  |
|---|---|--|--|
|   | main Matlab instructions and the ability to plot the obtained results;<br>- differential analysis of the theoretical methods. | on what they learned;<br>-Final project examination. |  |
| 10.5 Minimal performance standard   |   |  |  |
| - knowledge of the principal technics used for signal analysis in Matlab;<br>- design, implementation, and proof of functioning of a simple solution to a problem using Simulink. |   |  |  |

Date  
25.09.2017

Instructor for practical activities  
As. Drd. Ing. Valentin Niță

Date of department approval  
28.09.2017

Director of Department,  
Prof. Dr. Ing. E. Popovici