



**NATIONAL UNIVERSITY OF ENGINEERING**  
**COLLEGE OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**TELECOMMUNICATIONS ENGINEERING PROGRAM**

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**IT563 – LABORATORY OF TELECOMMUNICATIONS I**

**I. GENERAL INFORMATION**

<b>CODE</b>	: IT563 – Laboratory of Telecommunications I
<b>SEMESTER</b>	: 7
<b>CREDITS</b>	: 01
<b>HOURS PER WEEK</b>	: 02 (Laboratory)
<b>PREREQUISITES</b>	: IT313 – Laboratory of Telecommunications Instrumentation
<b>CONDITION</b>	: Mandatory

**II. COURSE DESCRIPTION**

The purpose of this course is to provide the student with a solid learning and familiarization in the use of MATLAB for simulating basic analog and digital communication systems, including sampling of continuous signals, signal filtering, transmission of an FM radiocommunication system, simulation of a ASK, PSK, and FSK communication systems.

**III. COURSE OUTCOMES**

At the end of the course the student will:

- Select correctly the equipment and instruments to be used according to the experience to be developed.
- Properly handles measuring and control instruments, configuring and connecting them correctly.
- Use MATLAB for data processing and visualization, and interpret the results to formulate conclusions.
- Compare the experimental results with the theoretical ones verifying the validity of the circuits built in the laboratory experiences.
- Prepare clear technical reports detailing the process developed, interpreting results and formulating conclusions.

**IV. LEARNING UNITS**

**LABORATORY 1**

Learning and familiarization in the use of MATLAB continuous, discrete signals and sampling.

**LABORATORY 2**

Signal filtering

**LABORATORY 3**

Transmission of an FM radiocommunication system

#### **LABORATORY 4**

PCM transmission system

#### **LABORATORY 5**

Use of the LEYBOLD TPS 7.2.2.4 Module

ASK Modulation: Dynamic characteristics of the ASK signal with filter and without filter. ASK spectrum. ASK spectrum without filter. ASK spectrum with filter. ASK demodulation.

#### **LABORATORY 6**

Use of the LEYBOLD TPS 7.2.2.4 module

FSK modulation: Dynamic characteristics of the FSK signal. FSK spectrum without filter. FSK demodulation.

#### **LABORATORY 7**

Use of the LEYBOLD TPS 7.2.2.4 Module

PSK Modulation: Dynamic characteristics of the PSK signal. PSK spectrum without filter. Interpretation of the spectrum. PSK demodulation.

#### **LABORATORY 8**

Simulation of a QPSK radiocommunication system.

### **V. METHODOLOGY**

The course is developed in laboratory sessions of telecommunications systems. In the sessions of the laboratory experiences, the professor presents the laboratory guides. At the end of the laboratory, the student teams must submit a technical report. In all sessions the active participation of the student is promoted.

### **VI. EVALUATION FORMULA**

The learning will be evaluated through the "D" system:

- This course's final grade (FG) is calculated averaging the 06 highest laboratory grades.

$$FG = \frac{L1 + L2 + L3 + L4 + L5 + L6 + L7 + L8 - \text{mins}(L1 \text{ to } L8)}{6}$$

### **VII. BIBLIOGRAPHY**

- "Radar Signal Analysis and Processing Using MATLAB", Bassem R. Mahafza. CRC Press, 2016.
- "A Practical Approach to Signals and Systems", D. Sundarajan. John Wiley & Sons, 2009.
- "The Student Edition of MATLAB Version 4 User' S Guide" Prentice Hall 1995.