NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ELECTRICAL AND ELECTRONICS ENGINEERING

TELECOMMUNICATIONS ENGINEERING PROGRAM

IT564 – LABORATORY OF TELECOMMUNICATIONS II

I. GENERAL INFORMATION

CODE	**:**	IT564 – Laboratory of Telecommunications II
SEMESTER	**:**	8
CREDITS	**:**	01
HOURS PER WEEK	**:**	02 (Laboratory)
PREREQUISITES	**:**	IT563 – Laboratory of Telecommunications I
CONDITION	**:**	Mandatory

II. COURSE DESCRIPTION

The course prepares the student in the application of the concepts, methods and techniques of digital modulation, by analyzing data obtained in the ASK, FSK and PSK modules or by software simulation, monitoring of spread spectrum signals, applications of the line code and carrier recovery techniques. Application practices in engineering are developed and simulation software is used.

III. COURSE OUTCOMES

At the end of the course the student will:

- Check and identify the modulation techniques ASK, FSK and PSF interpreting the demodulation results.
- Use receiver simulation software to verify the most common causes of distortion in digital communications systems.
- Analyze, encode, process and transmit digital information using digital signal processing techniques.
- Produce clear technical reports using an established format, detailing the laboratory process developed, interpreting the results, describing the observations and formulating conclusions.
- Have oral and written communication skills in digital format.
- Have the capacity for teamwork.
- Raise awareness on environmental issues by encouraging the use of ICT and zero roles.

IV. LEARNING UNITS

1. MODULATION AND DIGITAL DEMODULATION: ASK, PSK AND FSK

Obtaining the characteristics of the digital modulation by using the LEYBOLD module, also comparing the input vs output ratio. / Determine the characteristics of the demodulation ASK, PSK and FSK / Compare with the results obtained by simulation.

2. **ONLINE CODES**
   Study and verification of the fundamental characteristics of some line codes / NRZ / RZ / Bipolar NRZ / Unipolar RZ / Unipolar NRZ / PNRZ / BRZ / Bipolar AMI RZ / AMIR / Bipolar MANCHESTER / etc.

3. **THE EFFECT OF ISI AND NOISE THROUGH THE OBSERVATION OF THE EYE DIAGRAM**
   Study and verification of the most common causes of distortion in digital communications systems / The ISI effect.

4. **TRANSMISSION OF DIGITAL SIGNS BY SPECTRUM DISPERSION (SPREAD SPECTRUM)**
   Simulation of signal transmission by spectrum dispersion / Fundamental characteristics / Verify that the bandwidth of a message is less than the bandwidth of the signal transmitted by spectrum dispersion.

5. **SIMULATION AND MONITORING OF A SIGNED SPECTRUM SIGNAL**
   Spread Spectrum techniques / Signal energy dispersion of a frequency band greater than that initially occupied.

6. **CARRIER RECOVERY AND SYNCHRONIZATION TECHNIQUES**
   Free work – Research Project.

V. METHODOLOGY

The course is developed in laboratory practice sessions, the teacher proposes modeling and simulation as an example of the blocks that make up the digital communications system. Evaluate the contents exposed by the students. It raises a series of questions and exercises related to the subject of laboratory practice that the student will solve in a non-face-to-face manner. Dynamization of the debate in the following week by all present. The use of pre-practice simulation software is promoted. In all sessions, teamwork and student leadership are promoted.

VI. EVALUATION FORMULA

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

- Each laboratory session is graded the following way:

$$L_i = \frac{\boldsymbol{PR + FR + S}}{\boldsymbol{3}}$$

Where:

- PR: Previous Report
- FR: Final Report
- S: Supporting presentation

Five laboratory experiences are graded during the semester and the final grade is the average of the four laboratory experiences with the highest grades:

$$FA = \frac{\boldsymbol{L1 + L2 + L3 + L4}}{\boldsymbol{4}}$$

VII. BIBLIOGRAPHY

- Leybold Modules Manuals
- Use Of Matlab Manuals

- Digital Communications: Fundamental & Applications - BERNARD SKLAR, PRENTICE HALL.

- Digital Communications: JOHN PROAKIS, MASOUD SALEHI - MCGRAW & HILL.