UNIVERSIDADE FEDERAL DO CEARÁ

FEDERAL UNIVERSITY OF CEARÁ
OFFICE OF THE VICE PROVOST FOR UNDERGRADUATION (PROGRAD)
COORDINATION FOR PROJECT AND CURRICULUM DEVELOPMENT
CURRICULUM DEVELOPMENT DIVISION

1. Academic unit offering the curricular component (Faculty, Center, Institute, Campus)**:**

Center of Technology

2. Department offering the curricular component (when applicable)**:**

Teleinformatics Engineering Department

3. Undergraduate course(s) offering the curricular component

Code of the Course	Name of the Course	Course Degree[1]	Curriculum (Year/ Semester)	Nature of the Component[2]	Semester of Offer[3]	Habilitation[4]
91	Telecommunications Engineering	Bachelor	2015.1	Mandatory	05	-

4. Name of the curricular component:
Communication Principles

5. Code of the curricular component (filled by PROGRAD)**:**
TI0120

6. Prerequisites	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0116	Signals and Systems

7. Corequisite	No (x)	Yes ( )	
		Code	Name of the curricular component / activity

8. Equivalences	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0059	Introduction to Communication Systems

9. Day period of the curricular component (more than one option can be selected)**:**
(x) Morning (x) Afternoon (x) Night

1 **Fill with *Bachelor (Engineer), Licenciate,* or *Technologist.***
2 **Fill with *Mandatory, Optional,* or *Elective.***
3 **Fill when mandatory.**
4 **When elective, fill with the habilitation or emphasis to which the curricular component is linked.**

10. Regime of the curricular component:

(x) Semester ( ) Yearly ( ) Modular

11. Justificatory for the creation/regulamentation of this curricular component

Communications belong to our daily life in a variety of forms. An introductory course in analog and digital communications is therefore essential to understand the transmission of information signals in the context of telecommunications.

12. Objectives fo the curricular component:

- Provide an introductory treatment of the communications theory applied to the transmission of information signals and directed to both analog and digital communications.
- Present the fundamental concepts of signal modulation and detection theory in the presence of noise.

13. Syllabus:

Spectral Density and Correlation. Analog Modulation Techniques. Noise in Analog Modulation. Digital Encoding of Analog Waveforms. Baseband Transmission and Intersymbol Interference. Optimum Receivers for Data Communication. System Noise.

14. Program:

1. **Spectral Density and Correlation of Energy and Power Signals.** Spectral Characteristics of Periodic Signals**.**
2. **Analog Modulation Techniques:** Amplitude Modulation. Suppressed Carrier Double Band Modulation. Multiplexing with Quadrature Carriers. Single Side Band Modulation. Vestigial Band Modulation. Comparison of Amplitude Modulation Techniques. Frequency Translation. Frequency Division Multiplexing. Application: Radio Broadcast. Angular Modulation. Frequency Modulation. PLL. Applications: FM Radio and FM Stereo.
3. **Spectral Characteristics of Random Signals and Noise:** Bandwidth Equivalent of Noise. Noise in Analog Modulation: Signal to Noise Ratio. Model of the AM Receiver. Signal to Noise Ratio for Coherent Reception. Noise on AM Receivers using Envelope Detection. Model of the FM Receiver. Noise on FM Reception. Threshold Effect on FM. Pre-emphasis and De-emphasis on FM. Discussions About the Studied Systems.
4. **Digital Encoding of Analog Waveforms:** Digital Pulse Modulation. Pulse Coding Modulation. Sampling. Quantization. Coding. Regeneration. Differential Pulse Coding Modulation. Delta Modulation. Time Division Multiplexing. Applications: Digital Multiplexing for Telephony.
5. **Intersymbol Interference:** Baseband Transmission of Binary Data. The Problems of Intersymbol Interference. Ideal Solution. Raised Cosine Spectrum. Correlative Coding. Baseband Transmission of M-ary Data. Eye Chart. Adaptive Equalization.
6. **Optimal Receivers for Data Communication:** Formulation of the Optimal Receiver Problem. Maximization of Ouput Signal-to-Noise Ratio. Matched Filter Properties. Binary PAM Error Probability. Noise in Digital Modulation Schemes. Coherent and Non-Coherent

Binary Wave Modulation Detection. Discussions About the Studied Systems.

7. **System Noise:** Electrical Noise. Thermal Noise. Impulsive Noise. Noise Figure. Equivalent Noise Temperature. Cascade Connection and Noise in Networks. Link Budget Calculation in Telecommunications - Received Signal Power Calculation. System Noise Temperature Calculation.

15. Workload description

Number of Weeks:	Number of Credits:	Total Workload in Hours:	Theory Workload in Hours:	Practice Workload in Hours:
16	04	64	64	-

16. Basic bibliography:

1- Simon Haykin and Michael Moher, Introdução aos Sistemas de Comunicação, 2nd edition, Bookman, 2007.

2- John G. Proakis, Masoud Salehi and Gerhard Bauch, Contemporary Communication Systems Using Matlab, 3rd edition, Cengage Learning, 2012.

3- B.P. Lathi, Zhi Ding, Modern Digital and Analog Communication Systems, 4th edition, Oxford University Press, 2009.

17. Complementary bibliography:

1- Simon Haykin, Sistemas de Comunicações, 4th edition, Bookman, 2003.

2- Simon Haykin and Michael Moher, Introduction to Analog and Digital Communications, 2nd edition, Wiley, 2006.

3- Hwei P. Hsu, Analog and Digital Communications (Schaum's Outlines), 2nd edition, McGraw-Hill, 2002.

4- Rogerio M. Carvalho, Comunicações Analógicas e Digitais, 1st edition, LTC, 2009.

5- B. Sklar, Digital Communications – Fundamentals and Applications, 2nd edition, Prentice Hall, 2001.