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

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

Center of Technology

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

Teleinformatics Engineering Department

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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	06	-

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4. Name of the curricular component:
Digital Communication Systems

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5. Code of the curricular component (filled by PROGRAD)**:**
TI0069

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6. Prerequisites	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0120	Communication Principles

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

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8. Equivalences	No (x)	Yes ( )	
		Code	Name of the curricular component / activity

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

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[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

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

The digitization of information is a necessary factor to maximize transmission rates and also the reliability of the offered services. It is therefore necessary to address studies on the transmission and reception of digital information signals in the context of telecommunications.

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12. Objectives fo the curricular component:

Provide a treatment of digital communications systems for the transmission of information in modern systems.

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13. Syllabus:

Signals and Systems, spectral analysis, signal detection; modulation with and without memory; coherent and non-coherent demodulation. PAM, PSK, QAM, FSK, and COM modulations. Inter-symbol interference; Nyquist criterion; Maximum likelihood receivers; Viterbi's algorithm; Linear equalization; Synchronization, carrier and clock recovery. Coded modulation; Multiple access techniques: TDMA, FDMA, CDMA, etc.

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14. Program:

1. **PAM modulation:** baseband PAM modulation, bandpass PAM modulation, minimum distance receiver, minimum distance sequence detection, performance analysis in AWGN system.

2. **Advanced modulations:** M-ary modulation; error probability; orthogonal modulation; PSK; QAM; modulation with memory; bandwidth and signal dimensionality; capacity and modulation; generalized Nyquist criterion.

3. **Probabilistic detection:** Real signal detection; detection of a complex vector; known signals in Gaussian noise; maximum likelihood detection; Viterbi algorithm; sequence detection; coherent and non-coherent detection.

4. **Signaling in band-limited channels:** Inter-symbolic interference; signal design to zero inter-symbolic interference; ideal Nyquist pulse for distortionless transmission; raised cosine pulse.

5. **Linear equalization:** optimal equation based on ZF; generalized equalization methods; fractionally spaced equalizer; transversal equalizing filters; Inter-symbolic interference and channel capacity.

6. **Carrier recovery:** decision directed carrier recovery; carrier recovery based on N-th power.

7. **Clock recovery:** clock recovery performance; spectral line methods; MMSE method and approximations.

8. **Multiple access techniques:** multiple access topology; TDMA; FDMA; CDMA.

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- John R. Barry, Edward A. Lee, David G. Messerschmitt, Digital Communication, 3rd edition, Springer, 2003.

2- Simon Haykin, Digital Communication Systems, 1st edition, Wiley, 2013.

3- John Proakis, Masoud Salehi, Digital Communications, 5th edition, McGraw-Hill Science, 2008.

17. Complementary bibliography:

1- B.P. Lathi, Modern Digital and Analog Communication Systems, 3rd edition, Oxford University Press, 1998.

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

3- Bernard Sklar, Digital Communications: Fundamentals and Applications, 2nd edition, Prentice Hall, 2001.