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	04	-

4. Name of the curricular component:
Electronic Circuits

5. Code of the curricular component (filled by PROGRAD)**:**
TI0057

6. Prerequisites	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0114	Electric Circuits

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

8. Equivalences	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0006	Electric and Electronic Circuits

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

Electronic circuits constitue a basis for every engineering course in which any aspect about electric energy will be approached. This course develops the basic principles that govern the electric signals and the electronic devices operating at low and medium frequencies. Its contents are fundamental for a solid formation of the telecommunications engineer.

---

12. Objectives fo the curricular component:

1. Develop electric models for electronic devices.

2. Analyze electronic circuits following a mathematical treatment in the time and frequency domains.

3. Analyze and design linear electronic circuits for small-signal models using BJT and MOSFET transistors, and operational amplifiers.

4. Analyze and design nonlinear electronic circuits using BJT and MOSFET transistors, and operational amplifiers.

---

13. Syllabus:

Basic models for amplifying circuits. Introduction to operational amplifiers. Basic circuits. Junction diodes. Diode-based circuits. Bipolar junction transistors. Polarization and operations with small-signal models. Field effect transistors. Linear electronic circuits. Frequency response. Analysis and design of feedback circuits. Active linear filters. Oscillators and signal generators. A/D and D/A converter. Communication circuits. Simulation of electronic circuits.

---

14. Program:

1. **Introduction to electronic circuits**: general models for amplifying circuits. Basic types of amplifiers: voltage amplifier, current amplifier, voltage/current and current/voltage converter amplifiers. Performance metrics. Introduction to the simulation of circuits using Spice and Multisim.

2. **Operational amplifier**: encapsulation of operational amplifiers (OpAmps). Ideal OpAmp basic configurations: inverter, non-inverter, adder. Finite gain effect. Frequency response: bandwidth. Commercial OpAmp imperfections: offset voltage, polarization currents, slew-rate. Examples of commercial OpAmps. Laboratory activities.

3. **Diodos de Junção**: electric characteristics of the junction diode. Physical operation of junction diodes: physical model of the PN junction. Basic types of junction diodes: rectfier diode, Zener's diode, light emitting diode (LED), photodiode, varicap diode. Junction diode applications: rectifier circuits, clippers and voltage regulators.

4. **Bipolar junction transistors**: physical structure and operation modes of the bipolar junction transistor (BJT), tne NPN and the PNP transistors, the amplification effect. Basic configurations: common emitter, common basis and common collector. Operational regions: linear, cut-off and saturation. Basic polarization circuits. Small-signal models: hybrid model, π-hybrid model. Basic amplifiers: voltage gain, input and output resistance, frequency

response. Multi-stage amplifiers. BJT as a switch. Laboratory activities.

5. **Field effect transistors**: physical structure and operation modes of the field effect transistor (FET) and MOSFET. Basic configurations: common source, common drain and common gate. Operational regions: linear, cut-off and saturation. Circuitos básicos de polarização. Basic polarization circuits. Small-signal models: hybrid model, π-hybrid model. Basic amplifiers: voltage gain, input and output resistance, frequency response. Comparison between FET and BJT. Multi-stage amplifiers.

6. **Introduction to linear integrated circuits**: the differential BJT pair: differential gain and common mode gain, polarization with active load and with current source. Current mirrors. OpAmp 741 analysis.

7. **Active linear filters**: the filter transfer function. Design methods. Second-order LCR resonator. Activer filters with inductor replacement. Biquadratic active filters. Switched capacitor filters. Analog switches. Project and implementation Projeto of active analaog Butterworth's and Chebyshev's filters.

8. **Oscillators and signal generators**: basic principles of sinusoidal oscillators. Oscillator circuits with OpAmps. Crystal oscillators. Integrated circuit timers. Signal generators. Sweeping circuits. Voltage-controlled oscillators. Voltage-current converters.

9. **Power amplifiers**: Classification. Efficiency. Topology. Practical circuits for classes A, B, C, and AB amplifiers. Integrated power amplifiers. MOS power transistors.

10. **A/D and D/A converters**: Signal sampling and holding. Converter algorithms and topologies. Practical circuits.

15. Workload description

Number of Weeks:	Number of Credits:	Total Workload in Hours:	Theory Workload in Hours:	Practice Workload in Hours:
16	06	96	64	32

16. Basic bibliography:

1- Sedra & Smith; Microeletrônica, Prentice Hall, 5th edition 2007.

2- Laboratory activities' script.

17. Complementary bibliography:

1- Giovanni Bianchi; Electronic Filter Simulation & Design; McGraw-Hill, 1st edition, 2007.

2- Keith Billings, Abraham I. Pressman; Switching Power Supply Design; McGraw-Hill, 3rd edition, 2006.

3- G. Randy Slone; High-Power Audio Amplifier Construction Manual; McGraw-Hill, 2nd edition, 2007.