



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	Optional	-	-

4. Name of the curricular component:

Satellite Communications

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

TI0071

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

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

8. Equivalences	No ()	Yes (x)	
		Code	Name of the curricular component / activity
		TI0028	Satellite Communications

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), Licenciante, 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: Semester Yearly Modular**11. Justificatory for the creation/regulamentation of this curricular component**

The integration of communications systems and networks in the context of technological convergence aims to establish terrestrial and spatial communications. Thus, with satellites integrated with other types of communication systems, they reach a global communication system, that is, communication in any form, anywhere at any time.

12. Objectives fo the curricular component:

Provide the student with the elements and fundamentals of satellite communications systems, aiming at obtaining competence for the understanding, manipulation and implementation of projects and related situations.

13. Syllabus:

Overview of Satellite Systems, Orbits and Launching Methods, Geostationary Orbit, Space Segment, Space Link, Interference, Satellite Access, Satellites and the Internet, Direct Broadcast Satellite, Satellite Services.

14. Program:

1. **Overview of Satellite Systems:** Frequency Allocation for Satellite Services; Intelsat; Domsats; Polar Orbiting Satellites.
2. **Orbits and Methods of Launch:** Kepler's First Law; Kepler's Second Law; Kepler's Third Law; Definitions and Terms in Earth Orbit Satellites; Orbit Elements; Apogee and Perigee Heights; Orbit Disorders; Inclined Orbits; Synchronous-Solar Orbit.
3. **Geostationary Orbit:** Antenna Sight Angles; Polar Mount Antenna; Visibility Limits; Almost Geostationary Orbits; Earth Eclipse of the Satellite; Release Orbits.
4. **Space Segment:** The Power Supply; Altitude Control; Station Maintenance; Thermal Control; TT & C Subsystem; Transponders; Antenna Subsystem; Morelos; Anik-E; Advanced Spacecraft N-Shots.
5. **Terrestrial Segment:** Reception-Only Residential Television System; Master Antenna System for Television; Community Television Antenna System; Transmitter-Receiver Terrestrial Station.
6. **Space Link:** Radiated Isotropic Power Equivalent; Transmission Loss; Link Power Balance Equation; System Noise; Carrier / Noise Ratio; Uplink; Downlink; Rain Effects; Combination of the C / N Ratio Up- and Downlinks; Intermodulation Noise.
7. **Interference:** Interference between Satellite Circuits (Modes B1 and B2); Dispersion Energy; Coordination.
8. **Satellite Access:** Single Access; Pre-Signed FDMA; FDMA with Signature on Demand; SPADE system; Bandwidth Limitation and Power Limitation in TWT Amplifier Operation; TDMA; On-board Signal Processing for FDMA / TDM Operations; TDMA Satellite

Switching; Code Division Multiple Access.

9. **Satellite and Internet Services:** Network Layers; TCP Link; Satellite and TCP Links; TCP Quality Improvements in Satellite Channels using Standard Mechanisms (RFC-2488); Request for Comments; TCP Connections Division; Asymmetric Channels; Proposed Systems.
10. **Direct Broadcast Satellite:** Orbital Spacings; Power Measurement and Number of Transponders; Frequencies and Polarization; Transponder Capacity; Digital TV Bits Rates; MPEG Compression Standards; Error Correction in a Direction; External Domestic Reception Unit (ODU); Internal Domestic Reception Unit (IDU); Downlink Analysis; Uplink. Analysis.
11. **Satellite Services:** Mobile Satellite Services; VSATs; Radarsat; Global Positioning Satellite System; Orbcomm.

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- Dennis Roddy, Satellite Communications, 4^a edição, McGraw-Hill, 2006, ISBN: 0-07-146298-8.

17. Complementary bibliography:

- 1- Bruce R. Elbert, The Satellite Communication Applications Handbook, 2^a edição, Artech House, 2003, ISBN: 1580534902.
- 2- Michael O. Kolawole, Satellite Communication Bacheloring, CRC, 2002, ISBN: 9780824707774.