



# 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 <sup>1</sup>	Curriculum (Year/Semester)	Nature of the Component <sup>2</sup>	Semester of Offer <sup>3</sup>	Habilitation <sup>4</sup>
91	Telecommunications Engineering	Bachelor	2015.1	Optional	-	-

**4. Name of the curricular component:**

Mobile Communications II

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

TI0087

6. Prerequisites	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0063	Mobile Communications I

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

8. Equivalences	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0039	Mobile Communications Systems II

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

(x) Morning                      (x) Afternoon                      (x) Night

<sup>1</sup> Fill with *Bachelor (Engineer), Licenciante, or Technologist.*

<sup>2</sup> Fill with *Mandatory, Optional, or Elective.*

<sup>3</sup> Fill when mandatory.

<sup>4</sup> 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**

Mobile communications systems, such as mobile telephony, represent an important means of communication, with great economic and social impact, making it necessary to understand the technical details of its operation.

**12. Objectives for the curricular component:**

This course deepens the concepts presented in Mobile Communications I with emphasis on transceiver architectures, transmission channel modeling and performance characterization.

**13. Syllabus:**

Characterization of Fading Channels. Link Management Techniques. Diversity and Multiple Antenna Techniques. Spread Spectrum Techniques. Quality of Service in Mobile Communications. Radio Resource Management. Modulation and Multiple Access by Orthogonal Division of Frequency.

**14. Program:**

1. **Characterization of Fading Channels:** concepts of delay, Doppler and angular spread; concepts of time, band and distance of coherence; types of fading; intersymbol interference; methods for calculating the error and outage probability in channels with fading; performance of digital modulations on fading channels.
2. **Link Management Techniques:** channel coding: block, convolutional, turbo and lattice codes; interlacing; adaptive channel modulation and coding; link quality measures in practical systems; description of aspects of link management in practical systems.
3. **Diversity and Multiple Antenna Techniques:** sources of diversity: in space, angular, in polarization, in time, multipath, in frequency; combination methods; spatial, temporal and frequency correlation; performance of digital modulation in channels with fading and diversity; adaptive antenna arrangements: diversity gain, signal-to-noise ratio gain, capacity gain.
4. **Spread Spectrum Techniques:** concept, direct sequence spread spectrum, spreading codes and relevant properties; performance of spread spectrum modulation with matched filter receivers; Rake receiver and multipath diversity; performance in the presence of multipath.
5. **Modulation and Multiple Access by Orthogonal Division in Frequency:** principle of multicarrier modulation; design criteria for OFDM-based transceivers; cyclic prefix; multiple access based on OFDMA; criteria for sub-carrier signaling in OFDMA; criteria for power allocation in OFDMA; management of radio resources in OFDMA.

**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- Lecture notes.
- 2- Wireless Communications (Hardcover); Andrea Goldsmith, Cambridge, 2005, ISBN-10: 0521837162; ISBN-13: 978-0521837163

**17. Complementary bibliography:**

- 1- Digital Communications - Teacher's Edition (Hardcover), John Proakis (Author), Masoud Salehi (Author), McGraw-Hill, 2007 ISBN-10: 0072957166, ISBN-13: 978-0072957167
- 2- Principles of Mobile Communication (2nd Edition) (Hardcover), Gordon L. Stüber; Springer, 2000, ISBN-10: 0792379985, ISBN-13: 978-0792379980
- 3- Fundamentals of Wireless Communication (Hardcover), David Tse (Author), Pramod Viswanath (Author), Cambridge, 2005, ISBN-10: 0521845270, ISBN-13: 978-0521845274