



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:

Optical Communications

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

TI0064

6. Prerequisites	No ()	Yes (x)	
		Code	Name of the curricular component / activity
		TI0053	Waveguides
		TI0060	Electronic and Optoelectronic Materials

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

8. Equivalences	No ()	Yes (x)	
		Code	Name of the curricular component / activity
		TI0029	Optical Communication Systems

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

Morning Afternoon 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**

In the context of high-speed integration, fiber-optic communications systems play an essential role in establishing and maintaining data, voice and video communications.

12. Objectives fo the curricular component:

Provide the student with the conceptualization, understanding and mastery of the use of various methods and techniques in optical communications systems, as well as the ability to design fiber optic communications systems.

13. Syllabus:

Introduction to fiber optic communications; review on Maxwell equations, wave equations and waveguides; optical fibers; optical devices, optical interferometers, optical modulators, optical transmitters; optical modulators, optical receivers; coherent optical systems; multi-channel optical systems; optical amplifiers; soliton communication systems.

14. Program:

1. **Introduction to fiber optic communications:** historical perspective, basic concepts.
2. **Review of Maxwell equations, wave equations and waveguides:** Wave propagation in dielectric media; propagation in anisotropic media; polarization of light; optical fibers.
3. **Optical fibers:** monomode fiber and step and gradual multimode fiber; dispersion in fibers and fibers with displaced dispersion; Bragg grid in fibers; optical filters; Fibers of photonic crystals.
4. **Optical devices:** Optical circulator; optical coupling; beam divider by bias, rotator and compensator; optical attenuator.
5. **Optical interferometers:** Mach-Zenhder, Michelson and Sagnac interferometer.
6. **Optical modulators:** Phase modulator, amplitude and polarization.
7. **Optical transmitters:** light emitting diodes; semiconductor lasers; description of the photodiodes.
8. **Optical receivers:** description of the receivers; noise in receivers; sensitivity of the receptors.
9. **Coherent optical systems:** modulation formats; demodulation schemes; error rate in information transmission (BER); degradation of performance.
10. **Multichannel optical systems:** optical systems WDM; WDM components; time division multiplexing (TDM).
11. **Optical amplifiers:** semiconductor laser amplifiers; Raman amplifiers; Brillouin amplifiers; doped fiber amplifiers.

12. Solitonic communication systems: solution of the Schroedinger equation; soliton dispersion; collision between solitons.

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- Fiber Optic Communication Systems, Govind P. Agrawal, Wiley Series and Optical Bacheloring, 1997.
- 2- FREEMAN, Roger L. Fiber-optic systems for telecommunications. New York: Wiley-Interscience, c2002.
- 3- IIZUKA, Keigo; RHODES, William T. Bacheloring Optics. Springer eBooks, New York, NY: Springer . Science+Business Media, LLC, 2008.

17. Complementary bibliography:

- 1- DAVIS, Christopher C. Lasers and electro-optics: fundamentals and engineering. Nova York: Cambridge University Press, 2006.
- 2- GRAHAM-SMITH, Francis; KING, Terry A.; WILKINS, Dan. Optics and photonics: an introduction. 2nd edition, . Chichester, England: John Wiley & Sons, c2007.
- 3- GREEN JR., Paul E. Fiber optic networks. Englewood Cliffs, New Jersey: Prentice Hall, 1993.
- 4- HUBER, John C. Industrial fiber optic networks. Research Triangle Park: Instrument Society of America, 1995.