



# 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:**

Electromagnetic Compatibility

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

TI0100

6. Prerequisites	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0065	Antennas

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

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

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

Electromagnetic compatibility studies the project and operation of equipments as to making immune to a certain level of electromagnetic interference and, at the same time, to its own interference, so that they are within pre-established limits. In the design of communication devices and systems, the engineer has to use electromagnetic compatibility to fit the project to the existing regulation laws.

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

Provide theoretical and practical knowledge for the usage of electromagnetic compatibility techniques in the design of devices and systems.

**13. Syllabus:**

Maxwell's equations and electromagnetic fields. Electric circuits and signals. Interference sources. Shielding and openings. Interference control techniques. Electromagnetic compatibility standards. Measurement and testing techniques. Study cases.

**14. Program:**

1. **Maxwell's equations and electromagnetic fields:** Maxwell's equations in integral and differential forms; static and semi-static fields; time-varying fields.
2. **Electrial circuits and signals:** lumped and distributed components; signal representations; linear circuit response to deterministic and random signals; non-linear circuit response; noise characterization.
3. **Electromagnetic interference sources:** classification of electromagnetic interference sources; natual interference sources; artificial interference sources.
4. **Shielding and openings:** shielding theory, shielding efectiveness, opening theory, numerical simulation of shielding and openings, shielding effectiveness with openings.
5. **Interference control techniques:** shielding and grounding, filtering and nonlinear protection devices, general design principles.
6. **Electromagnetic compatibility standards:** civilian standards, military standards, limits to human exposition to electromagnetic fields, Brazilian norms.
7. **Measurement and testing techniques:** measurement tools, testing environments.
8. **Study cases:** wireless systems, microprocessor systems, automotive systems, devices.

**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- Paul, Clayton R., "Introduction to Electromagnetic Compatibility", 2nd edition, Wiley Interscience 2006.
- 2- Christopoulos, Christos; "Principles and Techniques of Electromagnetic Compatibility"; 2nd edition, CRC Press 2007 .

**17. Complementary bibliography:**

- 1- Dhia, Sonia Ben; "Electromagnetic Compatibility of Integrated Circuits", Springer 2006.
- 2- Sanches, Durval; "Interferência Eletromagnética", Interciência 2003
- 3- Kouyoumdjian, Ara; "Compatibilidade Eletromagnética", ArtLiber 1998.