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	Mandatory	05	-

4. Name of the curricular component:
Introduction to Control Systems

5. Code of the curricular component (filled by PROGRAD)**:**
TI0118

6. Prerequisites	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0116	Signals and Systems

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

8. Equivalences	No ( )	Yes (x)	
		Code	Name of the curricular component / activity
		TI0047	Signals and Systems

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

Currently, automation occupies an important role in almost every segment of industry, commerce, and more recently in home appliances. The continuous search for a better performance of industrial and nonindustrial processes lead mandatorily to the utilization of information systems for control and automation. In this scenario, the course of instrumentation and control, which belongs to the body of knowledge of computer engineering, contributes to integrate knowledge acquired by the students in other curricular components of their undergraduate course into the solution of problems related to industrial system automation, enabling them to deal systematically with equipment and processes. Thus, it is fundamental that the engineer have a professional formation relative to automation to enable him/her to work in the mentioned areas.

12. Objectives fo the curricular component:

1- Use techniques of system analysis to design and specify industrial automatic control systems..
2- Analyze and establish strategies to control instrumentation plants.
3- Provide basic knowledge about the different types of controllers, sensors, transducers, and drivers found in industrial automation..
4- Analyze the general concepts about supervisory and control systems: communication, information, and signaling.

13. Syllabus:

Review; performance of close-loop control systems; stability of dynamic systems in time-domain; stability of dynamic systems in frequency-domain; controller design.

14. Program:

1. **Review**: Introduction and motivation, characterization of linear systems, system linearization techniques, differential equations, linear systems transfer functions, mathematical modeling of physical systems, block diagram algebra.

2. **Performance of close-loop control systems**: performance of first and second order systems, root locus in s-plane and its relationship with the transient response, steady-state errors in feedback control systems, performance specification, project example: speed control of a D.C. motor.

3. **Stability of dynamic systems in time-domain**: concept of stability, Routh-Hurwitz stability criterion, relative stability of closed-loop control systems, root locus method, project example: temperature control of an industrial oven.

4. **Stability of dynamic systems in frequency-domain**: s-plane contour maps, Nyquist criterion and Bode diagram, frequency-domain performance specification, stability of control systems with dead-time, project example: position control for a D.C. motor.

5. **Controller design**: project constraints, time-domain approach for controller design: on-off control and PID (proportional–integral–derivative) control, adjustment methods – sensibility limits and . Abordagem no domínio do tempo para controladores: Controle Liga-Desliga and

controle PID – Proporcional Integral and Derivativo. Métodos de Ajuste – maximum controller sensitivity and controller sintony, controller sintony by gain margin and phase margin, design of phase advance or phase delay using root locus, design of feedforward controllers, project example: servomechanism for a mobile robot.

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- Feedback Control Systems, C. L. Phillips and R. D. Harbor, Prentice-Hall

2- Modern Control Systems, Richard C. Dorf and Robert H. Bishop, McGraw-Hill

3- Linear Control System – Analysis and Design, J. J. D'Azzo, C. H. Houpis, McGraw-Hill.

17. Complementary bibliography:

1- Process Instruments and Control Handbook, Douglas M. (Editor In Chief) Mcgraw-Hill Company.

2- Sensors & Circuits: Sensors, Transducers, & Supporting Circuits For Electronic Instrumentation Measurement and Control, Prentice Hall

3- Laboratory activities' script.

4- Princípios de Controle e Servomecanismo, Bottura, C.P.. Ed. Guanabara Dois.

5- Priciples of Electronic Instrumentation, A. James Diefenderfer and Brian E. Holton, Saunders College Publishing

6- Fundamentos de Instrumentação para Monitoração e Controle de Processos. Borchardt, I. G. & Brito, R.M. Ed. Unisinos, São Leopoldo.

7- Controle por Computador – Desenvolvendo Sistema e Aquisição de Dados para PC, J. Tarcisio Costa Filho and C. Protásio de Souza. Edufma.