Syllabus

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Automation and Computer Science
1.3 Departament	Automation
1.4 Field of study	Systems Engineering
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Automation and Applied Informatics (English)
1.7 Form of education	Full time
1.8 Subject code	41.00

2. Data about the subject

2.1 Subject name	***Electric and Electronic Control Equipment***				
2.2 Course responsible/lecturer	Sl. Dr. ing. Ruben Dan Crișan – ruben.crisan@aut.utcluj.ro				
2.3 Teachers in charge of applications	S. l.dr.ing. Crisan Ruben Dan - ruben.crisan@aut.utcluj.ro S. l.dr.ing. Harja Gabriel - gabriel.harja@aut.utcluj.ro ing. Bulgar Danut - Valentin - bulgardanut@gmail.com Asis.dr.ing. Birs Isabela Roxana - just2garfield4this_world@yahoo.com Asis.dr.ing. Stanese Mihai Radu - stanesemihai@yahoo.com				
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment *(E/C/V)*	E
2.7 Type of subject	*DF – fundamental, DID – in the field, DS – specialty, DC – complementary*				DS
	DI – compulsory, DO – elective, Dfac – optional				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminar	0	Laboratory	2	Project	0
3.2 Number of hours per semester	56	of which:	course	28	Seminar	0	Laboratory	28	Project	0
3.3 Individual study										
(a) Manual, lecture material and notes, bibliography										5
(b) Supplementary study in the library, online and in the field										3
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										5
(d) Tutoring										3
(e) Exams and tests										3
(f) Other activities:										0

3.4 Total hours of individual study (sum of (3.3(a)...3.3(f)))	19
3.5 Total hours per semester (3.2+3.4)	75
3.6 Number of credit points	3

4. Pre-requisites (where appropriate)

4.1 Curriculum	System theory, Fundamentals of Electronic Circuits, Computer programming
4.2 Competence	Mathematics, basic electronics circuits, computer operating.

5. Requirements (where appropriate)

5.1. For the course	The student needs to be present at 70% of the total number of lectures in order to have the right to take the exam.
5.2. For the applications	The student is allowed to participate to an application class only by presenting a report for the previous application.

6. Specific competences

6.1 Professional competences	• **C4 –** Design, implementation, testing, operation and maintenance of systems with generic and dedicated equipments, including computer networks for control engineering and applied informatics ○ **C4.1 –**Defining the requirements of applicable standards and of the methods of implementation, testing, operation and maintenance for the equipments ùsed in the applications of automatic control and applied informatics based on on the operation and design principles . ○ **C4.2 –**Explaining and interpreting the methods of design, implementation, testing, operation and maintenance for the generic and spcific equipments ùsed in the applications of automatic control and applied informatics ○ **C4.3 -** Solving practical problems of monitoring and automatic control and problems of applied informatics by using and adapting equipments (digital and analogue) and by using information technologies. ○ **C4.4 -** Evaluation through monitoring, diagnosis, analysis of experimental data, in accordance with specific standards of performance of the design, implementation, testing, validation, operation and maintenance of equipment and computer networks activities when used for automatic control and informatics applications ○ **C4.5 -** Development and implementation of technical projects for automatic systems and information systems, that include general purpose and dedicated equipments (digital and analogue), including computer networks.
6.2 Cross competences	

7. Course objectives

7.1 General objective	Knowledge of fundamental principles, the constructive-technological and conceptual issues underlying common automation equipment (transmitters, controllers, indicators, recorders, Programmable Logic Controllers), assimilation of knowledge concerning the possible use of such equipment to implement automatic control systems for industrial processes.
7.2 Specific objectives	• Wiring and commissioning of common control systems equipment in typical industrial application. • Wiring, commissioning and programming of programmable logic controllers (PLC). • Designing and building automation equipment (transmitters, indicators, PID controllers) using microcontroller development systems.

8. Contents

8.1**. Lecture** (syllabus)		No.hours	Teaching methods	Notes
C1.	Introductive notions. Electromechanical relays, electronic relays.	2	Slides presentation, explanations and demonstrations on whiteboard, discussions	
C2.	Time, magnetic and optic relays.	2		
C3.	Signal transmiters (temperature).	2		
C4.	Signal transmitters (ph, pressure, flow).	2		
C5.	Indicators, recorders, integrators.	2		
C6.	Automatic Controllers with PID structure: basics, analog controllers, digital controllers, control algorithms.	2		
C7.	Automatic Controllers with PID structure: values display, wiring, commissioning, auxiliary modules, auxiliary functions	2		
C8.	Usual digital controllers: configuration	2		
C9.	Digital systems in industrial process control, SCADA systems.	2		

C10. Digital systems in industrial process control - Industrial communication	2		
C11. Programmable logic controllers (PLC): generalities, hardware configuration	2		
C12. Programmable logic controllers (PLC): the graphset concept, ladder diagrams	2		
C13. Programmable logic controllers (PLC): sequential process control applications.	2		
C14. Programmable logic controllers (PLC): continuous process control applications.	2		

Bibliography
1. Fundamentals of PLC, sensors and communications, J. Stenerson,2004
2. PID control, F. Haugen, Tapir Uttrykk, 2004.
3. Engineering instrumentation and control, Haslam J. A., 1993
4. Lessons In Industrial Instrumentation, Tony R. Kuphaldt,2009
5. Basic Instrumentation Measuring Devices And Basic PID Control, CNSC Technical Training Group, 2003
6. Nașcu, Ioana Nașcu, R. Crișan, S. Folea, Echipamente și sisteme de automatizare, UTPRESS, 2015. ISBN 978-606-737-099-7.

8.2. **Applications**	No.hours	Teaching methods	Notes
L1. Signal transmiters: connection, configuration, utility	4	Wiring and comissioning of common control systems equipment in typical industrial application, PLC programming, implementing and testing the applications on the lab stands. Explanations and demonstrations on whiteboard, discussions.	
L2. Indicators and recorders used in industrial automation	2		
L3. Digital controllers: connection, configuration, testing, connection to the PC, distributed control system, supervision, monitoring	4		
L4. Autotunning of digital controllers	2		
L5. PLC – I/O numerical configuration, applications	4		
L6. PLC – I/O analogue configuration, applications	4		
L7-L9. Sorting system application, cut to length application	2		
L10. PLC - connecting and programming the programmable terminals, applications	2		
L11. PID control using PLC	2		
L12. Relays: Reed, thermal, optical, magnetic, time	2		

Bibliography
1. I. Naşcu, R. Crisan, Echipamente și sisteme de automatizare. Îndrumător de laborator
2. Users Manuals.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Lectures and applications content was discussed with field experts. Over the years the course was favourably assessed by various rating agencies: National Council for Academic Evaluation and Accreditation, Romanian Agency for Quality Assurance in Higher Education.

10. Evaluation

Activity type	Assessment criteria	Assessment methods		Weight in the final grade
Course	theory, problems	Written exam	Written exam – on line, Exam.net+Zoom	60%
Laboratory	individual work results	Oral	Oral on line (zoom)	40%
Minimum standard of performance: Wiring and configuration of the automatization equipment, connection, wiring and programming tne PLC				

Date of filling in:		Title Firstname NAME	Signature
30.03.2023	Course	S. l.dr.ing. Crisan Ruben Dan	
	Aplications	S. l.dr.ing. Crisan Ruben Dan S. l.dr.ing. Harja Gabriel Asis.dr.ing. Birs Isabela Roxana Asis.dr.ing. Stanese Mihai Radu	

Date of approval by the Automation Departament Board 30.03.2023	Head of Automation Departament Prof.dr.ing. Honoriu VĂLEAN
Date of approval by the Automation and Computer Science Faculty Council 30.03.2023	Dean Prof.dr.ing. Liviu Cristian MICLEA