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 Codul disciplinei	42

2. Data about the subject

2.1 Subject name	***Hydro-Pneumatic Control Equipment***				
2.2 Course responsible/lecturer	Assoc prof. dr. ing. Levente Tamas (Levente.Tamas@aut.utcluj.ro)				
2.3 Teachers in charge of applications	Assoc prof. dr. ing. Levente Tamas (Levente.Tamas@aut.utcluj.ro)				
2.4 Year of study	3	2.5 Semester	2	2.6 Assessment *(E/C/V)*	E
2.7 Type of subject	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DS
	DI – compulsory, DO – elective, Dfac – optional				DOB

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	75	of which:	course	28	Seminar	0	Laboratory	28	Project	0
3.3 Individual study										
(a) Manual, lecture material and notes, bibliography										9
(b) Supplementary study in the library, online and in the field										1
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										2
(d) Tutoring										0
(e) Exams and tests										3
(f) Other activities:										4
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	Control engineering, system theory
4.2 Competence	Design and implementation of basic control loops including also electrical and telecommunication equipment English

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Attendance is compulsory. Reading and understanding of the lecture notes.

6. Specific competences

6.1 Professional competences	To have knowledge about the functional principles of the fluid equipment's. To have an in-depth knowledge about the analysis and synthesis of the control loops containing hydro-pneumatic equipment. To have understanding of the interfaces for these equipment. To choose the right equipment for a fluid control loop. To be able to design and build fluid control loops. To have knowledge about specific controllers, sensors, interfaces for hydro-pneumatic systems.

6.2 Cross competences	To have competences for making analysis/design of hydro-pneumatic systems To have the communication competences specific for engineers from the hydro-pneumatic domain To have the ability to adopt emerging technological parts specific from this domain.

7. Course objectives

7.1 General objective	Design, implementation, testing, usage, support for automation systems using fluid power.
7.2 Specific objectives	Earning knowledge about the design and functional principles of the hydro-pneumatic equipment. Synthesis of the control systems based on the hydro-pneumatic equipment.

8. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
Introduction to the hydraulic-pneumatic systems (applications, examples, analogies)	2	Presentation using beamer/online sharing possible	The presentations include real life examples as well as case studies.
Theoretical aspects of the fluids	2		
Passive circuit elements	2		
Active circuit elements	2		
Applications to active-passive circuit elements	2		
Pneumatic actuators	2		
Pneumatic transducers	2		
Pneumatic cylinder control equipment	2		
Discrete pneumatic circuits	2		
Pneumatic controllers	2		
Hydraulic amplifiers	2		
Hydraulic motors	2		
Hydraulic logic elements	2		
Case study of a control loop	2		
Bibliography 1. Gh.Lazea, R.Robotin, S.Herle, C.Marcu – Echipamente de automatizare pneumatic si hidraulice UTPress 2006. 2. A.Hanieh – Fluid Power Control : Hydraulics and Pneumatics- Cambridge Publishing. 2012. 3. James Daines - Fluid Power: Hydraulics and Pneumatics, Goodheart Willcox Publ., 2009			
8.2 Applications (seminar/laboratory/project)	No.hours	Teaching methods	Notes
Flow measurement with restrictor	4	Practical work including computation and discussion/or online variant on Teams	Encouraging team work 2-3 students in a group
Pneumatic amplifiers.	4		
Electro-pneumatic converter	4		
Pneumatic actuators and pressure transducers	4		
Sorting application with pneumatic Fischer equipment	4		
Control of a Festo pneumatic robot	4		
Simulation of hydraulic circuits in SymHydraulics	4		
Bibliography 1. L. Tamas et. al.: Hydraulic and Pneumatic Control equipment's –laboratory book, UTPress, 2015 2. Laboratory notes			

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

Both the equipment and the course content are including parts which were consulted with companies from this field, including Emerson, Baumann Automation, Bosch and Siemens representatives from Cluj-Napoca, Romania.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Theoretical concepts Analytic and synthetic work	Written exam/or online exam on Teams	8 from 10
Seminar	-		
Laboratory	Understanding the laboratory work as well as performing the hands on part	Laboratory colloquium / or online evaluation	2 from 10
Project	-		
Minimum standard of performance: 5 from 10			

Date of filling in:		**Title First name NAME**	**Signature**
01.07.2022	Course	Assoc. prof.. dr. ing. Levente Tamas	
	Applications	Drd. Alexandru Pop	
		Drd. Benjamin Kelenyi	

Date of approval by the Department Board ……..

Head of Departament .....
Prof.dr.ing. Honoriu VĂLEAN

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Date of approval by the Faculty Council ……

Dean
Prof.dr.ing. Liviu Cristian MICLEA

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