

# 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. Course information

2.1 Subject name	<b>Hydro-Pneumatic Equipments</b>				
2.2 Course responsible/lecturer	prof. dr. ing. Levente Tamas (Levente.Tamas@aut.utcluj.ro)				
2.3 Teachers in charge of applications	Drd. ing. Robert Konievic				
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				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										18
(b) Supplementary study in the library, online and in the field										18
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										5
(d) Tutoring										0
(e) Exams and tests										3
(f) Other activities:										0
3.4 Total hours of individual study (sum of (3.3(a)...3.3(f)))					44					
3.5 Total hours per semester (3.2+3.4)					100					
3.6 Number of credit points					3					

## 4. Pre-requisites (where appropriate)

4.1 Curriculum	Control engineering, system theory, process modelling
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	C4. To have knowledge about the functional principles of the fluid equipments and to have an in-depth knowledge about the analysis and synthesis of the control loops containing hydro-pneumatic equipments. C4.1 To have understanding of the interfaces for these equipments and to choose the right equipments for a fluid control loop in industry. C4.2 To be able to design and build fluid control loops and use the implementation methods studied for exploiting these equipments
------------------------------	--

	C4.3 To have knowledge about specific controllers, sensors, interfaces for hydro-pneumatic systems and using these devices in the industrial setups
6.2 Cross competences	<p>To have competences for making analysis/design of hydro-pneumatic systems</p> <p>To have the communication competences specific for engineers from the hydro-pneumatic domain</p> <p>To have the ability to adopt emerging technological parts specific from this domain.</p>

## 7. Learning outcomes

Knowledge:	System engineering for HP domain
Skills:	Design, implementation, testing, usage, support HP systems
Responsibility and autonomy:	P&ID understanding, standard HP control loop evaluation, quotation

## 8. 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 equipments. Synthesis of the control systems based on the hydro-pneumatic equipments. Testing of the hidro-pneumatic control systems.

## 9. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
Introduction to the hydraulic-pneumatic systems	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 with membranes	2		
Pneumatic transducers	2		
Pneumatic cylinder control equipments	2		
Discrete pneumatic circuits	2		
Hydraulic sources and motors	2		
Hydraulic control systems	4		
Case study of a control loops	4		
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 Aplicacions (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 cilinders	4		
Simulation of the pneumatic circuits	4		
Simulation of hydraulic circuits in SymHydraulics	4		
Bibliography			
1. L. Tamas et. al.: Hydraulci and Pneumatic Control Equipments –laboratory book, UTPress, 2015			

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

Both the equipments 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.

#### 11. 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			

<b>Date of filling in:</b> 10.01.2025		<b>Title Firstname NAME</b>	<b>Signature</b>
	Course	Prof. dr. ing. Levente Tamas	
	Aplications	Drd. ing. Robert Konievic	

  

Date of approval by the Department Board ..... _____	Head of Departament ..... Prof.dr.ing. Honoriu VĂLEAN
Date of approval by the Faculty Council ..... _____	Dean Prof.dr.ing. Vlad Mureșan