# Syllabus

**1. Data about the program of study**

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| 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**

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| 2.1 Subject name | ***Hydro-Pneumatic Control Equipments*** | | | | |
| 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* | | | | DI |

**3. Estimated total time**

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|---|---|---|---|---|---|---|---|---|---|---|
| 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)

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| 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<br>English |

**5. Requirements** (where appropriate)

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| 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**

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| 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.<br>C4.1 To have understanding of the interfaces for these equipments and to choose the right equipments for a fluid control loop in industry.<br>C4.2 To be able to design and build fluid control loops and use the implementation methods studied for exploiting these equipments |

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

**7. Course objectives**

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| 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. |

**8. Contents**

| 8.1 Lecture | No.hours | Teaching methods | Notes |
|---|---|---|---|
| Introduction to the hydraulic-pneumatic systems | 2 | Presentation using beamer/online shareing 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<br>1. Gh.Lazea, R.Robotin, S.Herle, C.Marcu – Echipamente de automatizare pneumatic si hidraulice UTPress 2006.<br>2. A.Hanieh – Fluid Power Control : Hydraulics and Pneumatics- Cambridge Publishing. 2012.<br>3. James Daines - Fluid Power: Hydraulics and Pneumatics, Goodheart Willcox Publ., 2009 | | | |
| 8.2 Aplications (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 | | |
| Simulation of the pneumatic circuits | 4 | | |
| Simulation of hydraulic circuits in SymHydraulics | 4 | | |
| Bibliography<br>1. L. Tamas et. al.: Hydraulci and Pneumatic Control Equipments –laboratory book, UTPress, 2015 | | | |

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

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| 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. |

**10. Evaluation**

| Activity type | Assessment criteria | Assessment methods | Weight in the final grade |
|---|---|---|---|
| Course | Theoretical concepts<br>Analytic and synthetic work | Written exam/or online exam on Teams | 8 from 10 |
| Seminar | - | | |

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| 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 Firstname NAME** | **Signature** |
|---|---|---|---|
| 10.06.2024 | Course | Prof. dr. ing. Levente Tamas | |
| | Aplications | Prof. dr. ing. Levente Tamas | |
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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. Mihaela Dinsoreanu

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