



LABORATORY PLANNING GUIDE

L28 Mechatronics & Automation Laboratory

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Covered subjects according to the curriculum

Major topics of learning content but not limited:

- Familiarisation with a programmable logic controller (PLC)
- Familiarisation with and analysis of an automated materials handling process
- Familiarisation with different position and displacement sensors
- Experimental introduction to the fundamentals of hydraulics
- Electrohydraulic components
- Hydraulic position control loop with adjustable load conditions
- Reading and understanding circuit diagrams
- Replacing springs and adjusting the damper
- Influence of load and system pressure on control accuracy
- Influence of the amplifier constants on the stability
- Physical principles of pneumatics and electro-pneumatics
- Design and function of pneumatic components
- Multi-way valves, pressure, shut-off and flow control valves
- Simulation of controlled systems
- Configuration software
- Profibus DP field bus system
- OPC server function
- Recording digital and analogue signals
- Closed-loop control system response
- Choice of optimum controller parameters
- Tuning rules such as Ziegler-Nichols
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Main concept

The laboratory is designed for accommodation of 24 students + 2 laboratory staff:

- 2 - 4 students form a team and work together at a workstation / training system
- 13 workstations in 9 different types
- Each experiment unit either floor standing or on its own table to allow short prepare times
- 10 workstations are equipped with a PC
- Each workstation is equipped with a manual containing technical information, basic theory, experiment instructions, evaluation help and safety advice.
- Student teams are scheduled to change workstations from lab session to lab session in order to perform the entire range of experiments within the course duration.
- Average time per experiment: 90 to 120 minutes.

2 workstations for laboratory staff (with PC and internet access)

1 printer for common use

1 cupboard for small parts, consumables, tools, paper etc.

Initial training provided for laboratory personnel

Trainer: Specialized engineer of G.U.N.T. Gerätebau GmbH, Germany.

To be conducted immediately after installation and commissioning of the equipment.

General Topics to be covered for any of the educational systems:

- Basic familiarization with the system.
- Functions and components.
- Overall system configuration aspects.
- Start-up and operational aspects.
- Conduction experiments, including evaluation and calculation.
- Using the system with and without the software (where applicable).
- Trouble shooting and maintenance aspects.
- Hands-on, practical familiarization aspects.
- Seminar participants with the delivered system.
- Details of the manuals.
- Safe operation and preventive maintenance.

Requirements / Utilities

Power supply:

- 230 V / 50 Hz / 1 phase – at least 30 power sockets
- 400 V / 50 Hz / 3 phases – at least 2 power sockets

Laboratory computer network:

- 2 internet connections for staff
- 10 internet connections for students

Location:

- Laboratory space min 84 m²
- This laboratory could be installed on any floor (e.g. ground floor or 1st floor)

Schedule of requirements

Item No.	Description	Quantity
Item 1	PLC application: materials handling process	1 pcs.
Item 1.1	PLC module	1 pcs.
Item 2	Principles of industrial sensors	1 pcs.
Item 3	Training system: fundamentals of hydraulics	1 pcs.
Item 3.1	Components set electrohydraulics	1 pcs.
Item 4	Hydraulic servo system	1 pcs.
Item 5	Training system: pneumatics, electro-pneumatics and PLC	4 pcs.
Item 6	Operation of industrial controllers	1 pcs.
Item 7	Networking of industrial controllers	1 pcs.
Item 8	Setup of field bus systems	1 pcs.
Item 9	Optimization of control loops	1 pcs.