



LABORATORY PLANNING GUIDE

L51 Advanced Control Engineering Laboratory

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Covered subjects according to the curriculum

Major topics of learning content:

- planning and construction of different process applications
- planning and construction of different automation solutions for the control systems
- commissioning and optimisation of automated process applications
- making process connections (via pipes/hoses)
- connecting up the electricity supply and the instrumentation and control components
- fundamentals of the use of data acquisition, system control and parameter setting by software
- comparison of different sensors for level measurement
- comparison of different sensors for flow measurement
- level / flow cascade control
- level / flow cascade control
- planning, setting up, testing, optimising and assessing pressure control loops with different objectives and components
 - * constructing a 1st order pressure control system
 - * constructing a 2nd order pressure control system
- functional range of a digital process controller
- configuration, parameterisation and operation via keyboard
- familiarisation with an industry-standard configuration software
- signal links and standard current signals
- Profibus card as communications interface (CIF)
- functional range of a line recorder
- functional range of control valves
 - * electro-pneumatically driven
 - * pneumatically driven
 - * electrically driven
- functional range of a PLC
- programming a PLC using included programming software
- electrical connections and signal links

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
- 8 workstations, all differently configurable
- All workstations are floor standing
- All 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.

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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 25 power sockets

Others:

- Compressed air

Laboratory computer network:

- 2 internet connections for staff
- 8 internet connections for students

Location:

- Laboratory space min 72 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	Process automation training system: base module	8 pcs.
Item 1.1	Controlled system module: level	2 pcs.
Item 1.2	Controlled system module: flow	2 pcs.
Item 1.3	Controlled system module: pressure	2 pcs.
Item 1.5	Controlled system module: temperature	2 pcs.
Item 1.6	Continuous controller module	8 pcs.
Item 1.7	Switching controller module	8 pcs.
Item 1.8	Chart recorder module	8 pcs.
Item 1.9	Digital display	8 pcs.
Item 1.10	Software for controller configuration	1 pcs.
Item 1.11	Control valve, pneumatically driven, Kvs 0,4	2 pcs.
Item 1.12	Control valve, pneumatically driven, Kvs 1,0	6 pcs.
Item 1.13	Control valve, electrically driven, Kvs 0,4	2 pcs.
Item 1.14	Control valve, electrically driven, Kvs 1,0	6 pcs.
Item 1.15	Pressure sensor, 0...6bar	2 pcs.
Item 1.16	Pressure sensor, 0...2bar	2 pcs.
Item 1.17	Pressure sensor, 0...100mbar	2 pcs.
Item 1.18	Orifice with differential pressure sensor	2 pcs.
Item 1.19	Flow rate sensor: electromagnetic	2 pcs.
Item 1.20	Level sensor, capacitive	2 pcs.
Item 1.21	Temperature sensor PT100	2 pcs.
Item 1.22	Thermocouple (K) with head transmitter	2 pcs.
Item 1.23	Visualisation software	8 pcs.
Item 1.24	Profibus DP module for controller	8 pcs.
Item 1.25	PLC module with software	8 pcs.
Item 1.26	Profibus DP module for PLC	8 pcs.

Laboratory drawing

