



LABORATORY PLANNING GUIDE

L43 v2 Hydrology Laboratory (Civil)

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Covered subjects according to the curriculum

Major topics of learning content:

- bed-load transport in open channels
 - * subcritical and supercritical flow
 - * formation of ripples, dunes and antidunes
 - * observing the formation of meanders
- fluvial obstacle mark (siltation/scour formation): bridge pier and sluice gate
- bed-load transport formulae
 - * Meyer-Peter and Müller formula
 - * Einstein's formula
 - * determining the transport rate
- effect of precipitation of varying duration or intensity on soils with different saturation
- record hydrographs after precipitation
- storage capacity of soils with different saturation
- compare natural dewatering with dewatering via drainage pipe
- influence of rainwater retention basin on the hydrograph
- demonstrating transient drainage processes in two water reservoirs located one behind the other and determining the discharge
- recording oscillations of the surge chamber and measure natural frequency
- recording and displaying water level fluctuations
- investigating the seepage flow
- studying how wells affect the groundwater level over time
- groundwater level over time at one and two outlets
- determining flow nets in permeable media graphically
 - * streamlines under a sheet pile
 - * streamlines through an earth dam
 - * drainage at an open dike
- determining the pressure curve at a foundation and at a retaining wall
- potential flow in a Hele-Shaw cell for visualising flow lines:
 - * flow around drag bodies: cylinder, guide vane profile, square, rectangle
 - * flow through models: nozzle contour, sudden contraction or enlargement
 - * flow separation, flow with 90° deflection
- modelling the flow around bodies by overlaying parallel flow and sources and/or sinks:
 - * formation of Rankine half-bodies
 - * demonstration of a dipole
- fundamentals of filtration: Darcy's equation
- depth filtration with different bulk solids and suspensions
- cake filtration with different suspensions
- basic principles of open-channel flow
 - * uniform and non-uniform discharge
 - * flow formulae
 - * flow transition (hydraulic jump)
 - * energy dissipation (hydraulic jump, stilling basin)
 - * flow over weirs (sharp-crested, broad-crested, ogee-crested)
 - * discharge under gates
- - * flow-measuring flumes
 - * local losses due to obstacles
 - * transient flow: waves

- * vibrating piles
- * sediment transport

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
- 14 different workstations
- Each experiment base unit is floor standing
- 4 workstation 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.

1 large shelf for the storage of unused experiment accessories

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 20 power sockets
 - 400 V / 50 Hz / 3 phases – at least 4 power sockets
- distributed according to lab lay-out

Water:

- Cold Water
- Drain

Laboratory computer network:

- 2 internet connections for staff
- 4 internet connection for students

Location:

- Laboratory space min 160 m²
- This laboratory should be installed on the ground floor

Schedule of requirements

Item No.	Description	Quantity
Item 1	Open-channel sediment transport	1 pcs.
Item 2	Hydrographs after precipitation	1 pcs.
Item 3	Transient drainage processes in storage reservoirs	1 pcs.
Item 4	Advanced hydrological investigations	1 pcs.
Item 5	Open channel and closed channel flow	1 pcs.
Item 6	Studies in hydrology	1 pcs.
Item 7	Ground water flow	1 pcs.
Item 8	Visualisation of seepage flows	1 pcs.
Item 9	Sediment transport in river courses	1 pcs.
Item 10	Potential flow	1 pcs.
Item 11	Pipe networks	1 pcs.
Item 12	Water hammer and surge chamber	1 pcs.
Item 13	Cake and depth filtration	1 pcs.
Item 13.1	Balance	1 pcs.
Item 14	Experimental flume 309x450mm	1 pcs.
Item 14.01	Extension element of the experimental flume, 2,5m	1 pcs.
Item 14.02	Water tank, 1100L	1 pcs.
Item 14.10	Sluice gate	1 pcs.
Item 14.11	Radial gate	1 pcs.
Item 14.12	Set of plate weirs, 4 types	1 pcs.
Item 14.13	Broad-crested weir	1 pcs.
Item 14.14	Crump weir	1 pcs.

Item No.	Description	Quantity
Item 14.15	Siphon Weir	1 pcs.
Item 14.16	Rake	1 pcs.
Item 14.17	Ogee-Crested Weir with Pressure Measurement	1 pcs.
Item 14.18	Ogee-Crested Weir with 2 Weir Outlets	1 pcs.
Item 14.19	Elements for Energy Dissipation	1 pcs.
Item 14.20	Flume Bottom with Pebble Stones	1 pcs.
Item 14.21	Sill	1 pcs.
Item 14.22	Culvert	1 pcs.
Item 14.23	Set of Piers, 7 Profiles	1 pcs.
Item 14.30	Venturi Flume	1 pcs.
Item 14.31	Trapezoidal Flume	1 pcs.
Item 14.32	Parshall Flume	1 pcs.
Item 14.40	Vibrating Piles	1 pcs.
Item 14.41	Closed Sediment Circuit	1 pcs.
Item 14.42	Sediment Trap	1 pcs.
Item 14.43	Sediment Feeder	1 pcs.
Item 14.44	Wave Generator	1 pcs.
Item 14.45	Set of Beaches	1 pcs.
Item 14.50	Level Gauge	1 pcs.
Item 14.51	Digital Level Gauge	1 pcs.
Item 14.52	Pitotstatic Tube	1 pcs.
Item 14.53	Velocity Meter	1 pcs.
Item 14.54	Instrument Carrier	4 pcs.
Item 14.55	10 Tube Manometers	1 pcs.
Item 14.61	System for Data Acquisition and Automation	1 pcs.
Item 14.62	Electronic Pressure Measurement, 10x 0...50mbar	1 pcs.