



ADVANCED ELECTRICAL INSTALLATIONS

Hands-On Training for
Real-World Electrical Careers



THE CHALLENGE

Today's electrical workforce faces a growing skills gap. Training programs must go beyond theory and standard electrical installation. Students need hands-on experience with real-world systems to be job-ready from day one.

THE SOLUTION

LN Advanced Electrical Installations program delivers realistic, hands-on training systems, industry-relevant applications, and structured learning aligned with modern standards.



FIVE TRAINING AREAS. ONE INTEGRATED PROGRAM.

KEY BENEFITS

- Hands-on, job-ready skills
- Covers residential, commercial, and industrial applications
- Aligns with Building Services, EVCS, PV/ Battery Storage, Smart Grid
- Improves engagement and reduces training time

TRAINING AREAS

1. **Electrical Fundamentals**
AC/DC/3-phase systems, circuit analysis, measurements, troubleshooting.
2. **EV Charging**
Installation, safety, testing, load management, commissioning.
3. **Smart Energy & PV**
Solar systems, battery storage, grid interaction.
4. **Transformer Training**
Setup, configuration, distribution systems, safety.
5. **Smart Grid**
Generation, transmission, protection, distribution, energy management, SCADA.



“ REAL EXPERIENCE LEARNING MEANS:
ONLY THOSE WHO OPERATE, ANALYZE AND COMMISSION REAL
SYSTEMS DEVELOP SUSTAINABLE TECHNICAL COMPETENCE. ”

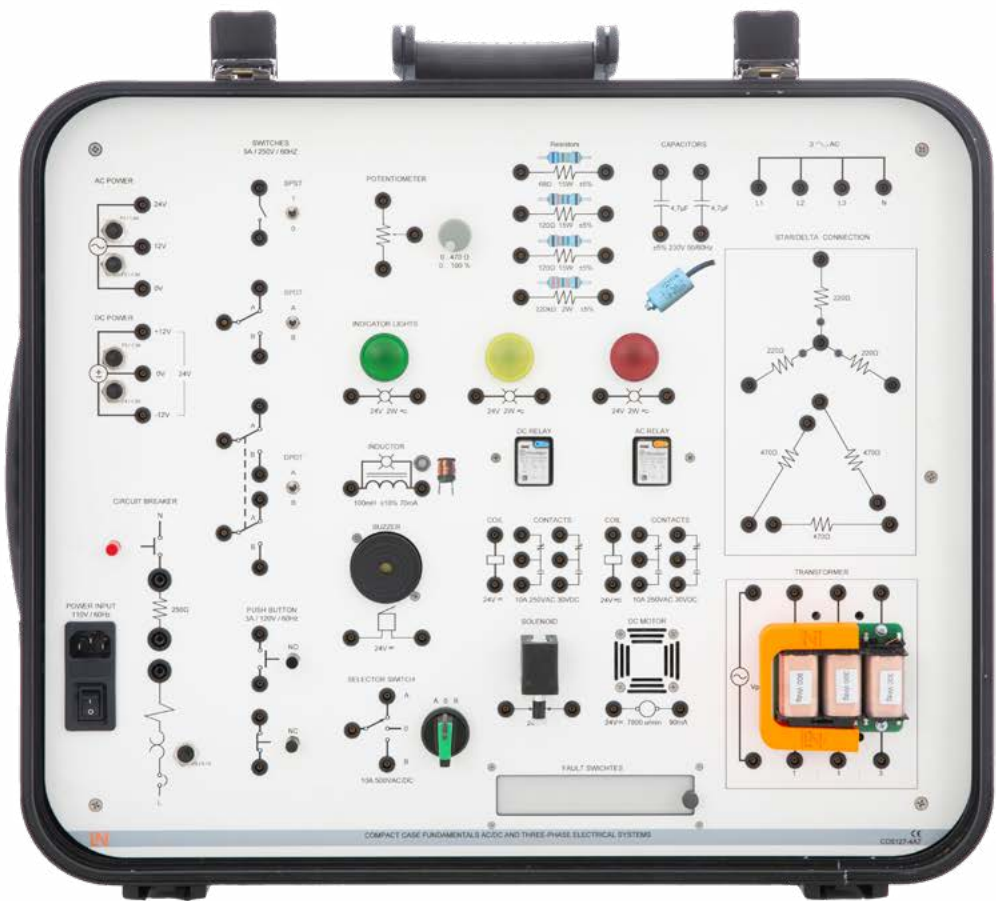
REAL-WORLD

Combines hardware, software, and lab exercises with real fault scenarios. Students perform real hands-on experiments and tasks, not just theory.

FUNDAMENTALS IN AC, DC AND THREE-PHASE CIRCUITS

Industrial Maintenance and Mechatronics Technician Trainer

Fundamentals of AC/DC and Three-Phase electrical systems used for power and control in industrial, commercial, agricultural, and residential applications.



Key Features

- Real-world industrial components
- Fault simulator included
- Fundamentals of three-phase electrical circuits
- Rugged carrying case with a removable lid for easy access
- Additional storage compartments in the lid
- Portable training system, student proof
- Full curriculum with experiments and tests included

A portable training system frees you to teach and learn wherever needed. Packaged in a carrying case, these systems are compact, deployable anywhere, quick to set up, and space-saving to store.

ADVANTAGES OF THE MOBILETRAIN SYSTEM

- Durable ABS housing with a removable lid
- Effortless transport via built-in telescopic handle and two large, stable casters
- An ergonomic, two-piece handle on the long side ensures the case is easy and comfortable to carry
- Removable foam cover in the lid
- Additional storage compartments for small parts
- A robust, ergonomic, two-piece handle on the long side makes it convenient to carry the case
- Can be stowed in the standard laboratory cabinets
- 2 locking latches and document pocket in the lid



Training Content

- Electrical circuits in direct current (DC), alternating current (AC) and three-phase (3P)
- Ohm's law
- Kirchhoff's voltage and current laws
- Using measuring instruments (voltmeters, ammeters, ohmmeters, oscilloscope, etc.)
- Resistors, inductors, capacitors
- Series and parallel circuits
- Circuit Analysis
- Circuit Protection Devices
- Electromagnetism
- Electrical distribution
- Voltage Dividers
- Power sources
- Relays, switches and contactors
- Transformer Sizing and Types
- Principles of Electric Motors
- Troubleshooting of electrical circuits (accessible via lockable switch box)

ELECTRIC VEHICLE CHARGING STATION TRAINER

Wallbox · Level 2 · NEMA 6-50R

A charging station also called Electric Vehicle Supply Equipment (EVSE) — supplies power for plug-in electric vehicles. The Lucas-Nuelle training system teaches installation, safety testing, and code compliance of charging stations, making it easy to integrate them into smart building systems.



Key Features

- Real-world industrial components
- Fault simulator included
- Real Wallbox Level 2, 240 V
- Rugged carrying case with a removable lid for easy access
- Additional storage compartments in the lid
- Portable training system, student proof
- Full curriculum with experiments and tests included

HARDWIRED CHARGING INFRASTRUCTURE

- Learning project, general overview
- Adaptation of charging infrastructure to upstream installation
- Electrical hazards
- Protective measures against electric shock
- Selection of components for charging infrastructure
- EV charging methods
- Inspection and testing per current standards
- Preparing an inspection report
- Setting up communication with the Wallbox
- Commissioning and configuration with the app
- Setting up interfaces: WiFi, Bluetooth, LAN, RS485
- Troubleshooting wallboxes

PORTABLE CHARGING INFRASTRUCTURE

- Learning project, charging cable
- Selection of suitable charging cables for applications
- Cross-section vs. charging current vs. labelling
- Connector variants for charging cables
- Inspection and testing of cables as portable devices
- Use of emergency charging cables
- Special issues regarding emergency cable inspection

Training Content

- Understanding the structure and function of charging infrastructure systems
- Identifying the various types of charging columns and connection cables
- Determining the energy and power requirements for charging systems
- Learning about load management and assessing the energy and power requirements at the site
- Understanding the technical and legal requirements for installation
- Learning about the technical standards for connecting charging stations
- Start/stop charging w/Rfid Card, or NFC enabled smart watch/phone
- Troubleshooting potential issues



SMART ENERGIES

RESIDENTIAL PV SYSTEM WITH STORAGE

Photovoltaic · Battery Storage

Smart interaction between photovoltaic systems and battery storage is playing an increasingly important role in using solar generation to reduce reliance on the grid. A grid isolation device enables the use of hybrid photovoltaic inverters and battery storage to continue supplying electricity during an energy grid outage. The training system makes it possible to set up and configure a practice-oriented residential hybrid photovoltaic system with battery storage and a grid isolation device.



Key Features

- Real-world industrial components
- Real solar module for indoor use
- Professional Solar panel emulator, 1.5 kW, 500 V
- Real hybrid inverter in grid-parallel mode
- Real battery storage with emergency power supply
- Mobile training system, student proof
- Full curriculum with experiments and tests included

TRAINING CONTENTS

ESE 1.1 Investigation of solar modules

- Recording daily and annual solar irradiance
- Exploring optimum alignment of solar modules (boosting energy yield)
- Recording solar module characteristics

ESE 1.2 Set-up of PV systems with hybrid inverters in grid-parallel mode

- PV system installation
- Set-up and testing of a PV system with grid feed-in and emergency power socket
- Measurement of energy generated by a PV system
- Maximum Power Point (MPP) tracking
- Determining the efficiency of the grid inverter
- Control operating response of the grid inverter
- Recording yield data using the solar emulator
- Investigating the response of the PV system to a grid outage
- investigating the provision of emergency power via dedicated emergency power socket
- Lightning protection of photovoltaic systems
- Dimensioning and economic efficiency of photovoltaic systems

ESE 1.3 Battery storage with emergency power supply

- Battery storage installation
- Set-up and testing of a PV system with hybrid inverter and battery storage
- Set-up and testing of a grid isolation device for emergency power supply
- Analyzing the energy streams of the PV system and battery storage
- Using the energy storage unit to boost power consumption
- Optimization of operating characteristics/response



PROFESSIONAL TRAINING OF LINEMAN - TRANSFORMER TRAINER

Hands-On Transformer Training. Train real transformer configurations used in the North American distribution system. In power engineering, transformers are used to connect different voltage levels within the power grid. At utility poles, electricity from regional distribution networks (4.6 kV to 33 kV) is transformed for end customers into low-voltage supply (single-phase 120/240 V or three-phase 208 V). Working at these voltage levels is life-threatening. Safe handling of electrical equipment must be learned to avoid endangering yourself and others. The Transformer Trainer provides practical, real-world training to build the necessary knowledge and hands-on skills for safe transformer operation and installation. Train real transformer configurations used in North American distribution systems. Understand how transformers are connected, what different configurations do, and how to safely test and analyze them.



Key Features

- Based on IEEE / ANSI standards (C57.12.70)
- Hands-on training with real-world equipment (not simulation only)
- Realistic wiring, configuration, and measurement tasks
- Simultaneous primary and secondary voltage monitoring
- Modular and expandable system (RLC loads, renewables, and more)
- Safe laboratory training environment, student proof
- Commercially available power transformer tester (optional)
- Safe handling under operational conditions
- Real-world fault scenarios
- Mobile training system, student proof
- Full curriculum with experiments and tests included

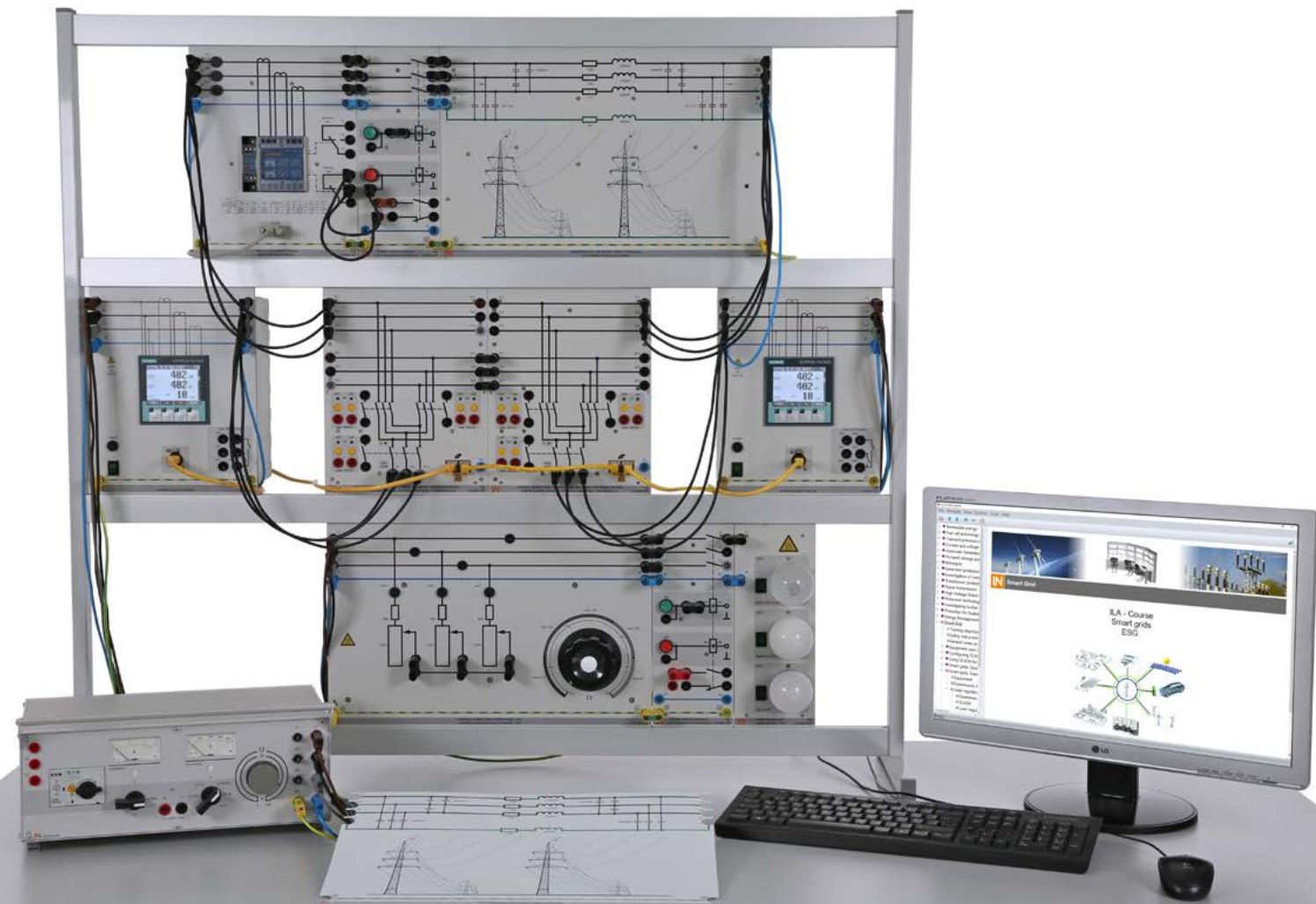
TRAINING CONTENTS

- Safety rules, setup, and configuration of transformers
- Commissioning and testing of single-phase transformers
- Overhead transformer standards
- Terminal markings: H and X
- Polarity check, ratio test, and determination of polarity
- Measuring the turns ratio
- Operating behavior, losses, and behavior under load
- Open-circuit and short-circuit tests
- Copper losses and no-load current
- Single-phase, split-phase three-wire, and three-phase systems
- Generation of 208 V three-phase and 120/240 V single-phase supply
- Installation of three-phase power transformer banks
- Business park connection and transformer bank configuration
- Wiring and operation of common transformer bank configurations:
 - Wye-Wye / Y-Y
 - Wye-Delta
 - Delta-Wye / Delta-Y
 - Delta-Delta
- Wye-Wye fundamentals, wiring, unbalanced loads, and neutral behavior
- Delta-Wye configuration and phasor diagram analysis
- Grounding concepts and special delta systems:
 - Floating Delta
 - Corner-grounded Delta
 - Four-wire Delta / wild leg systems
- Measurement of voltages under normal and fault conditions, including single phasing
- Troubleshooting in three-phase transformer banks
- Common fault patterns and fault diagnosis, including incorrect polarity



INTRODUCTION TO SMART GRID TECHNOLOGY

The Introduction to Smart Grid Technology training system provides hands-on training in modern power systems. It simulates three-phase power generation, models transmission lines equivalent to 380 kV systems, and allows switching between line lengths of 150 km / 93 miles and 300 km / 186 miles. Industrial digital relays, transformers, and SCADA software are used for line protection and monitoring. Power distribution is demonstrated through a realistic double busbar substation with circuit breakers, disconnectors, safety logic, and measurement instruments. The system also enables analysis of static, symmetric, and asymmetric loads. Smart meter experiments show how peak loads can be reduced over 24 hours, while energy management functions support efficient and sustainable grid operation under SCADA supervision.



Key Features

- Improved coordination between power demand and generation
- Modern information technology such as Internet, sensors, controllers and transmission equipment
- Smart metering - digital electricity meters measure power consumption at power grid's end points
- Shifts in household consumption away from peak load periods
- Utility-controlled operation of flexible loads, such as air conditioning, outside peak periods
- Learning to think before acting
- Mobile training system, student proof
- Full curriculum with experiments and tests included

TRAINING CONTENTS

Three-phase Power Generation

- Adjustable three-phase power supply
- Voltage adjustable between 0V to 255V/450V
- Three-phase transformer

Three-phase Transmission Lines

- Voltage increases on open-circuit lines
- Voltage drop as a function of line length
- Capacitive and inductive power losses on a line as a function of V and I
- Phase shift on a line

Three-phase Time Overcurrent Protection

- Designing and parameterizing overcurrent time protection
- Determining the reset ratio in the case of single-, double- and triple-pole short circuit
- Determining a relay's shortest release time
- Checking a circuit breaker's release behavior in the event of a failure

Three-phase Power Distribution

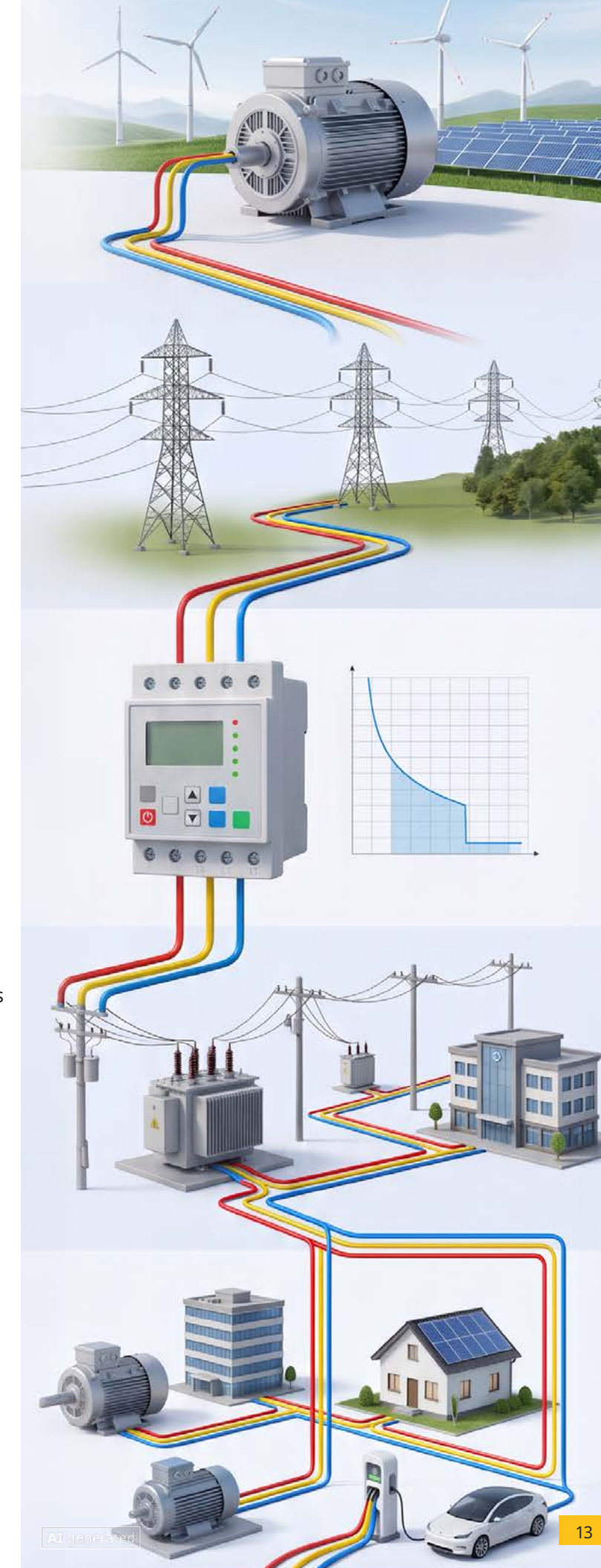
- Basic circuits of a three-pole, double busbar system
- Three-phase, double busbar system with load
- Preparation of algorithms for various switching operations

Three-phase Power Consumption

- Three-phase consumers with star and delta connections
- Measurement with active and reactive energy meters
- Static, symmetric and asymmetric loads
- The event of a phase failure

Three-phase Energy Management

- Load management via soft PLC
- Demand Side Management
- Recording of load profiles
- SCADA



WOULD YOU LIKE TO DIVE EVEN DEEPER?

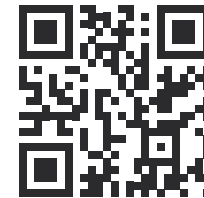
For advanced experiments and challenging applications in engineering education, be sure to explore our extensive product portfolio in the field of **Power Engineering & Renewable Energies**.

From fundamentals of power engineering to smart grids and renewable energies, we offer hands-on training systems for a modern and future-oriented engineering education:

TRAINING CONTENTS

- Fundamentals of power engineering
- Power generation
- Renewable Energies
- Transformers
- Power transmission
- Electric power distribution
- Energy management
- "Smart Grids" - Intelligent power supply networks
- "Microgrids" - Control of Stand-alone Networks
- Cyber Security

Dive deeper!



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Integration of renewable energies
Integrating solar, wind, and storage

Hydrogen as an energy storage
Flexible for industry and mobility

Integration & SCADA systems
Real-time monitoring and automation

Grid stability & security of supply
Compensating for fluctuations, preventing failures



IMPROVE SAFETY. REDUCE ERRORS. GET PLANTS BACK ONLINE FASTER.

Equip your team with the skills that really matter in modern grid systems.

Ready to upgrade your program?



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REAL EXPERIENCE **LEARNING**



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