LUCAS-NÜLLE

FUNDAMENTALS FOR RAILWAY TECHNOLOGY

LUCAS-NÜLLE FOR RAILWAY TECHNOLOGY

Railway Application Technology

Railway lines are the most important transport lines in the development and supply of wide areas incountries of the world. More than 25% of freight transport and more than 75% of local public transport are transacted by rolling stock and rail. Climate change and the ever-increasing volume of goods traffic will lead to rail becoming even more important in the coming decades. To limit global warming, among other things, a massive shift of traffic and transportation away from the roads to climate-friendly railways is necessary. In urban areas, the situation in passenger transport will also be impaired, unless there is a shift to rail.

In addition, growing trade flows around the world are leading to more goods traffic, which is no longer manageable for the roads alone. The expansion of rail freight traffic is becoming increasingly important. This makes it all the more important for our planners and engineers to have a systematic and well education in technology and an understanding of the relationships in the infrastructure and their forward-looking planning and maintenance.

Lucas-Nülle training systems support you in the technical basics and the interrelationships of various technologies, from electric and diesel-hydraulic drives, elctrical mains and energy power supply up to rail-vehicle technology and signal control.

More Than Just a Training System

Blended Learning, including E-learning and Hands-On Training.

Lucas-Nülle is a highly respected supplier of training systems, with a focus on providing not only a sound theoretical background but also the practical, hands-on skills that are essential to modern industry.

Using state-of-the-art technology Lucas-Nülle has designed numerous training platforms and systems that include blended learning, e-learning and hands-on systems so that every facet of mining engineering can be modelled and explored individually and discretely.

The systems are designed to parallel as closely as possible the equipment and methods used in practice by industry itself. This means that when the trainees qualify, they will already possess the abilities that they will need as they take the next step in their careers.

Solution for Railway Basics Application

The company's range of training aids covers the basic skills required by the new generation of railway technologists:

Skills covered by Lucas-Nülle training systems for railway application:

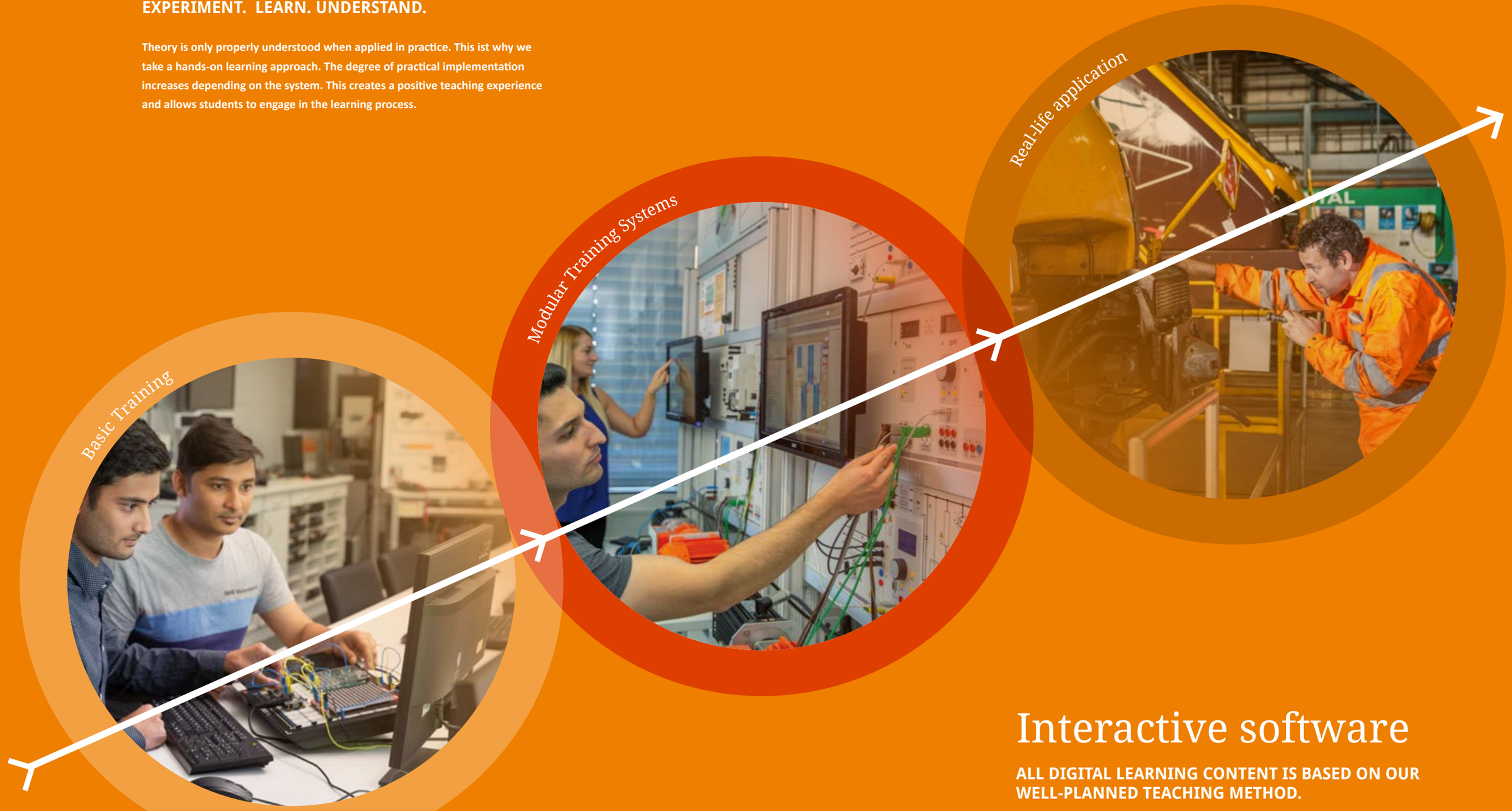
- Electrical Engineering
- Drive Technology
- Electrical Control
- Automation
- Process Control & Sensorics
- Micro Controller
- Electrical Power
- HVAC / Air Conditioning
- Fluid Power / Hydraulics and Pneumatics
- Mechanical Systems
- Diesel Engines

made in Germany

Let's get practical

EXPERIMENT. LEARN. UNDERSTAND.

Theory is only properly understood when applied in practice. This ist why we take a hands-on learning approach. The degree of practical implementation increases depending on the system. This creates a positive teaching experience and allows students to engage in the learning process.



Interactive software

ALL DIGITAL LEARNING CONTENT IS BASED ON OUR WELL-PLANNED TEACHING METHOD.

More than just hardware: interactive software is an essential part of all our systems. The digital courses contain animation, virtual instruments and experiments – which motivate learning with hands-on activities and procedures.

More Than Just a Training System

Fluid Power – Hydraulics and Pneumatics Training

Presenting complex training content in a vivid way using modern training media

Machines and Drive Technology

Electrical Power Engineering - From Power Generation to Consumption

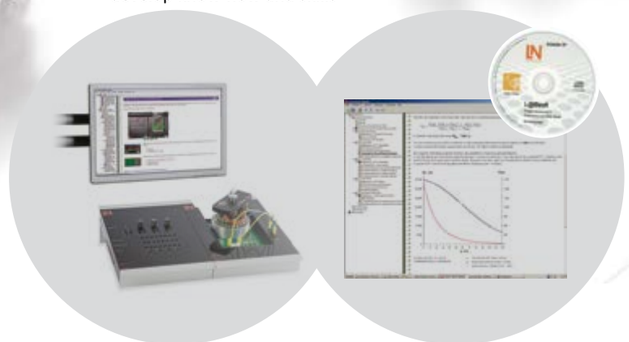
Industrial Control

Diesel Engines

Complete solutions for process control systems: PLC, AS-i, PROFIBUS, PROFINET, HMI, remote maintenance, safety technology, drive technology with the Industrial Conveyor Belt Systems

Machinery and Systems Engineering

With UniTrain, multimedia is used to develop know-how and skills



Real-life application
Authentic training in a safe environment

Convince yourself of the advantages:

Fundamentals of Electrical Engineering

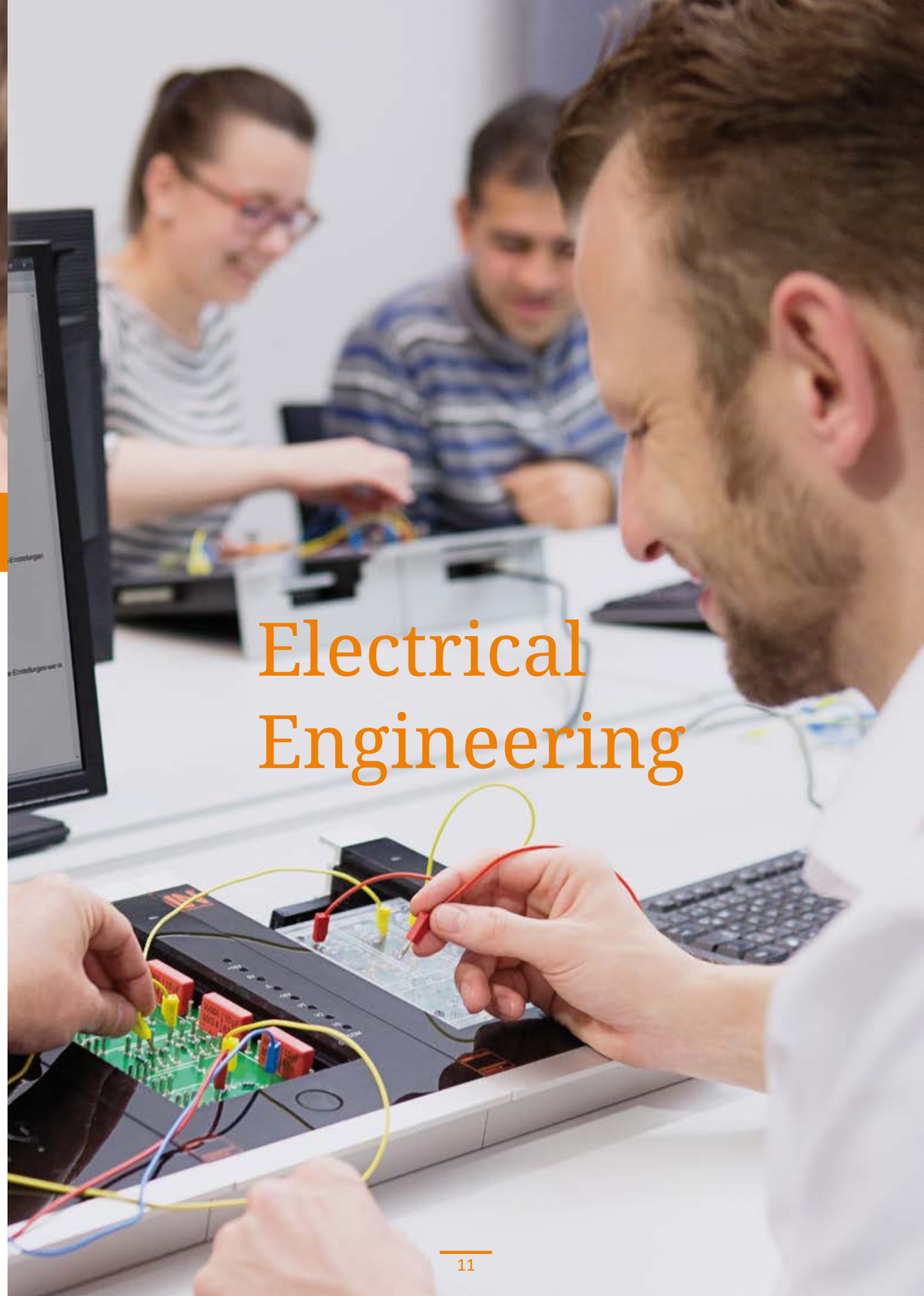
As in most industries today, modern railway vehicles involve a large amount of electrical equipment. Lucas-Nülle's UniTrain/Labsoft training systems, along with the Classroom Manager administration tools, help you to provide an introduction to the key components and principles of electrical engineering, including motors, generators and electronic components, as well as familiarising students with the use of circuit diagrams and essential measuring instruments.

UniTrain – Multimedia Desktop Lab

LEARNING – EXPERIMENTING – UNDERSTANDING

Benefits to you:

- More than 130 training programs
- Covers the entire field of electrical engineering
- More than 120 measuring instruments and power sources in one piece of equipment
- Promotes individual learning
- Practical skills gained by practical experimenting
- Safe experimenting with safety extra-low voltage
- Training programs combine theory and practice
- Authoring tools and administration



Electrical Engineering

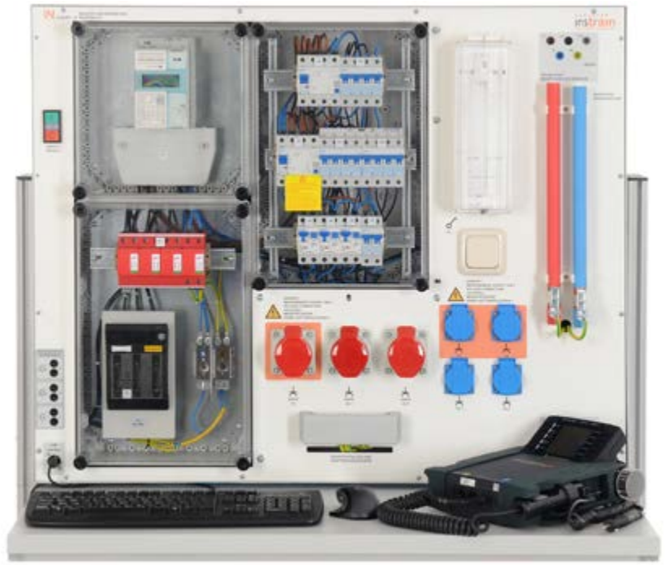
Drive Technology

Electrical Machines and Drive Technology

Electrical machines include motors of various kinds which can be used for driving machinery as well as equipment used on the supply side such as generators and transformers. The machines used for training in electrical engineering are designed so that nearly all of the circuitry and drives found in industry, commerce and at home can be covered for educational purposes by means of hands-on training. Many of the components the training systems use are directly adopted from industry itself. That means the systems can focus on the handling and operation (e.g. setting parameters) of real industrial equipment. For instance, using the servo drive/braking system, the response of the drives can be investigated dynamically and statically and using different working machines.

Topic coverage:

- DC machines / AC machines
- Asynchronous machines
- Synchronous machines
- Frequency converter drives
- Making windings in electrical machines and transformers
- Assembly of industrial control cabinets



Industrial Control

Industrial control systems are essential to any industrial installation. It is vital that such systems be both reliable and fail-safe. This topic ranges from simple control circuitry to modern PLC systems and their programming. Wiring of electrical systems is another inescapable necessity in the modern world. This topic provides an introduction to many standard circuits used for wiring appliances and power networks as well as IT installations. The training in protective measures that the systems impart includes both theoretical and practical instruction and provides ideal support for both.

Topic coverage:

INDUSTRIAL WIRING INSTALLATION

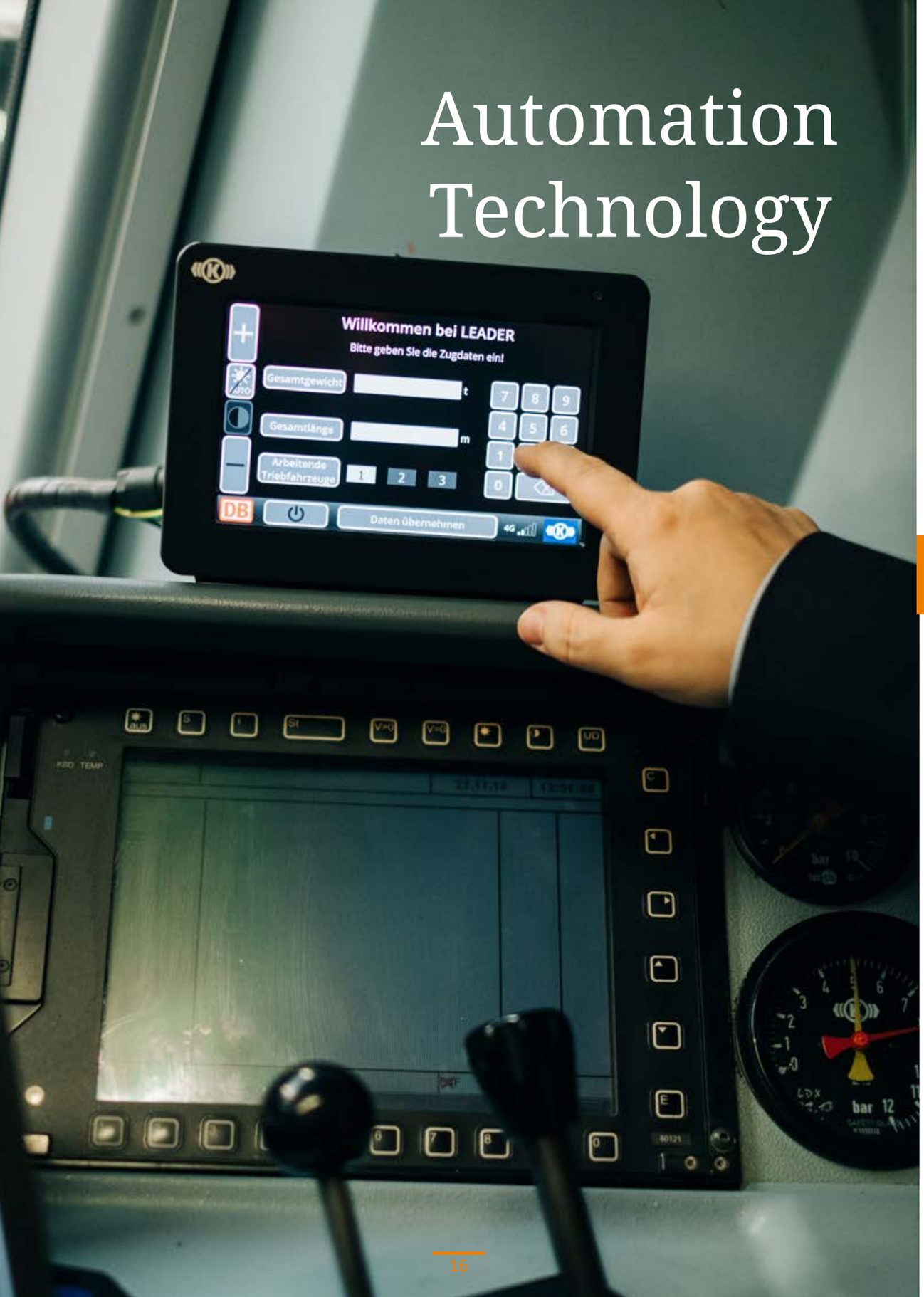
- Manual and contactor switching in three-phase circuits
- Complex plant circuitry
- Control and instrumentation project
- Plant measurement technology
- Programmable miniature control systems

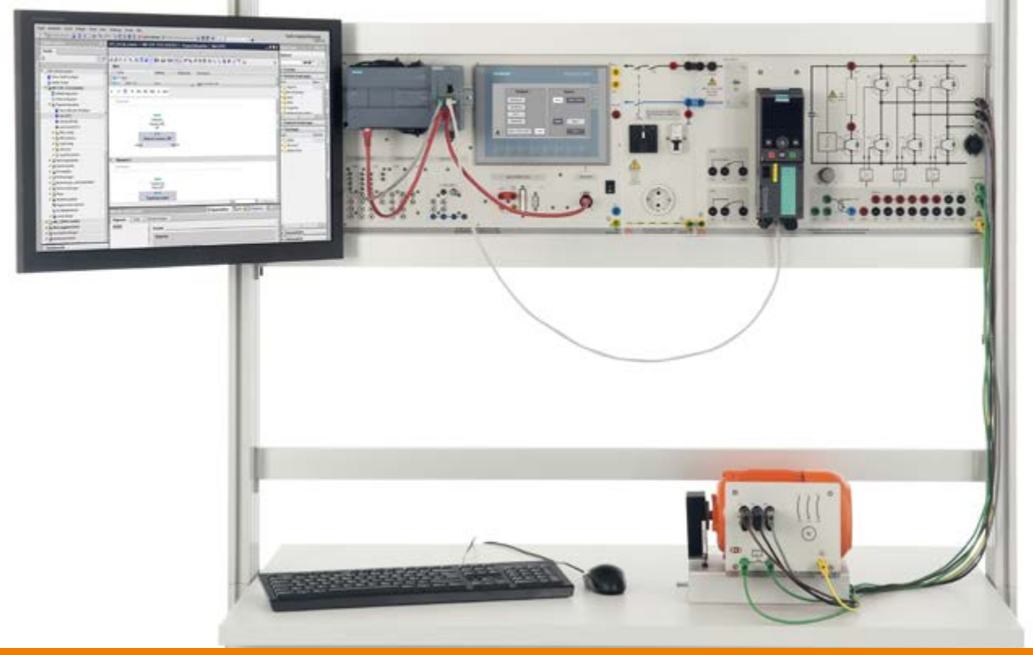
PROTECTIVE MEASURES

- Standards and terms applicable to protective systems for electrical wiring
- Network earthing systems (for instance, TN, TT, IT)
- Protection against lightning and excess voltage
- Checking electrical appliances after maintenance
- Carrying out tests on built-in systems
- Systematic troubleshooting methods and developing fault-finding strategies

Electrical Control

Automation Technology





Automation Technology

A lot of operations nowadays are carried out by automated systems. Many such systems have programmable logic control (PLC) installations at their core. There is also a growing trend towards the interconnection of appliances and equipment by means of bus systems, which allow for extremely flexible automatic control. All of this demands that today‘s automation technicians should have been trained using practice-oriented training systems which teach them to understand the latest technology but also endow them with the required hands-on skills to use it.

Topic coverage:

- Human-machine interface (HMI)
- Bus communication systems
- CAN-Bus
- Drive technology
- Open-loop control
- Troubleshooting

Telematic and Sensorics

Process control involves a holistic approach to the control of equipment which commonly involves feedback from continually monitored instruments and sensors, whereby both automated and manual systems are in place to manage individual systems as well as the entire flow of a process. From closed-loop control of individual systems to flexible automation of entire processes, the various courses convey the fundamentals, the principles and the properties of components used in automated processing and production plant with the aid of animations and numerous experiments involving authentic equipment. Multiple experiments cover investigation of controlled systems, determination of step responses and optimisation of control loops.

Topic coverage:

- Design, wiring and commissioning of a process engineering plant
- Selection, deployment and connection of different sensors and transducers
- Measurement of electrical and process-control variables like liquid level, flow-rate, pressure and temperature
- Design, assembly and commissioning of control loops
- Analysis of controlled systems and control loops
- Putting continuous and discontinuous controllers into operation
- Setting parameters and optimising P-action, PI-action and PID-action controllers
- Design of open-loop, closed-loop and PLC programs
- Operating and monitoring processes
- Networking process engineering systems

Process Control Sensorics

Micro Controller

Microcontrollers, FPGA, Microprocessors

Intelligent systems need microcomputers. Nowadays, they are no longer exclusively operated by programmers. Using UniTrain, our complete package solution can teach various programming languages and hardware architectures in a common and easy-to-understand format.

Topic coverage:

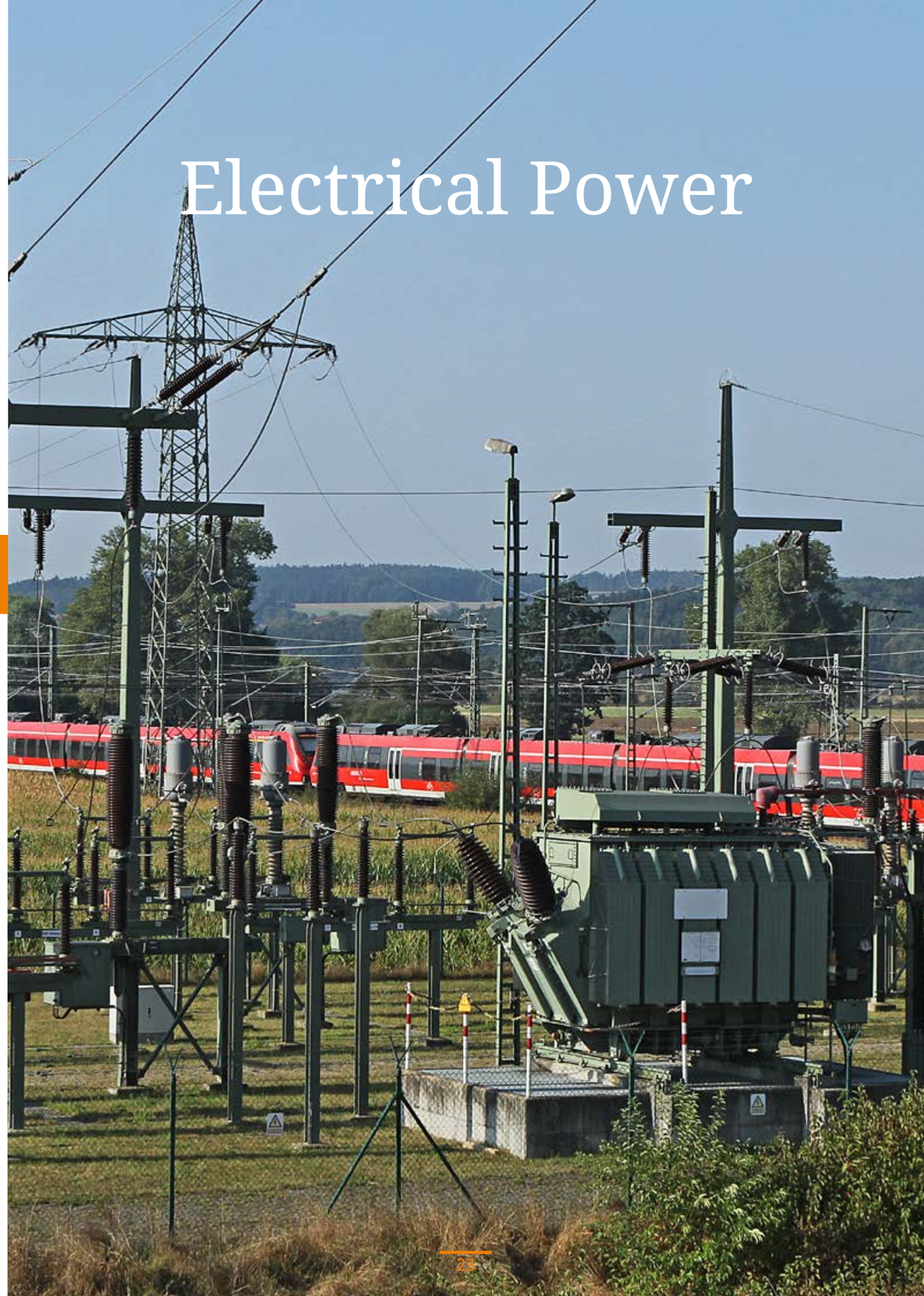
- Programming languages (including UML and VHDL)
- Hardware architecture from 8 bit to 32 bit
- Controlling cyber-physical systems (CPS)
- Programming the Internet of Things (IoT)
- Basics of computer technology

Electrical Power Engineering – From Power Generation to Consumption

Provision of electrical power, whether from local installations or from the national electricity grid, is a subject in its own right. The Lucas-Nülle systems cover this disparate topic in detail but in a way that nevertheless maximises the safety of students. The systems are so extremely versatile that they can be adapted to fit all of the wide-ranging training requirements applicable to electricians, technicians or fully fledged engineers.

Topic coverage:

- Energy generation training system
- Transformer training system
- Distribution training system
- High-voltage transmission lines training system
- Energy management training system
- Protective systems training system
- SCADA control



HVAC | Air Conditioning

From basic to complex applications

Improved energy efficiency, new plant designs and refrigerants, complex regulations or customer-specific solutions: refrigeration and air-conditioning technology face many challenges. Our systems explain the whole specialist area from basic thermodynamics to complex refrigeration applications in order to equip engineers and technicians with the knowledge they need.

Topic coverage:

- Thermodynamics
- Refrigeration processes
- Industrial refrigeration technology
- Split-climate systems with heat pump function
- Assembly of refrigeration technology modules

Topic coverage:

- Pneumatics
- Electro-pneumatics
- Simple hydraulic systems
- Electro-hydraulics
- Mobile hydraulics
- Troubleshooting
- A multimedia course guides students step by step through the topics

Fluid Power – Hydraulics and Pneumatics Training Equipment

This topic covers both pneumatic (air-operated) and hydraulic (liquidoperated) systems to convey the skills needed to understand and control them. The objectives specified by the project description in the hydraulics and pneumatics training set are based on existing practice and closely emulate work done for actual customers from both large and small-scale industry.

Fluid Power Hydraulics | Pneumatics

Mechanical systems

Machinery and Systems Engineering

Mechanical systems cover the various types of drive and conveyance systems and the principles behind them. The subject includes conveyor belt systems, chain drives, various gearing and transmission assemblies plus clutches and brakes, along with how mechanical systems are installed, operated and maintained. The course conveys methodical technical skills in dealing with mechanical systems. In addition to fundamental background knowledge, the combination of expertise in open- and closed-loop control as well as skills in fine manipulation provides all the capabilities essential to a future career.

Topic coverage:

- Assembly and disassembly of components
- Belt drives
- Chain drives
- Introduction to the functioning of gearbox transmissions
- Couplings
- Bearings
- Gaskets and seals
- Clutches and brakes
- Maintenance and repairs
- Commissioning and optimisation of configuration

Diesel Engines

Diesel Engines

Much equipment in the mining industry is powered by internal combustion diesel engines. The Lucas-Nülle common rail training system covers the principles of how such engines work as well as allowing hands-on work with real engines. It is based on the latest technology and educational experience, utilising all today's technical possibilities.

Topic coverage:

- How an engine management system works
- Design and function of sensors and actuators
- Enhancing diagnostic skills
- Making measurements on the components of an engine management system as done in practice
- Measurement and testing of electrical, electronic, hydraulic, mechanical and pneumatic variables
- Configuration of engine management systems
- Technical communication

LUCAS-NÜLLE EXPERTISE:

- Supply of laboratory equipment and furniture
- Target oriented project design
- All-in-one services from concept to realization
- Turn-key solutions
- Competent partner in the field of technical education for 40 years

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