Partner for biopharmaceutical manufacturing education and skills development

Industry-informed learning solutions that prepare students and professionals for careers in modern biopharmaceutical manufacturing

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Biopharmaceutical manufacturing, laboratory automation, and advanced biotechnology facilities depend on highly skilled professionals who can operate, maintain, and optimize increasingly automated systems.

Whether you are developing a new biotechnology program, enhancing an existing training facility, or creating training for new and incumbent employees, Festo can help prepare learners for careers in modern life sciences environments.

Preparing the workforce for the next generation of biopharmaceutical manufacturing



The biopharmaceutical industry is experiencing unprecedented growth driven by advances in biologics, cell and gene therapies, personalized medicine, and laboratory automation. At the same time, manufacturers are facing a growing workforce shortage as demand for skilled technicians, operators, laboratory personnel, and automation specialists outpaces the available talent pool.

Today's biopharmaceutical facilities rely on sophisticated automation technologies to ensure product quality, regulatory compliance, and effective risk mitigation. From bioreactors and process instrumentation to laboratory automation and digital manufacturing systems, success depends on a workforce capable of operating, maintaining, and optimizing increasingly complex systems.

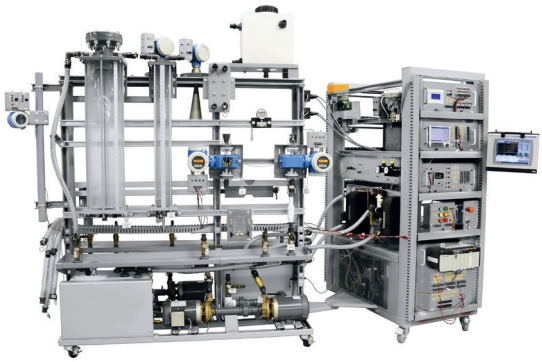
As a global leader in industrial and process automation, Festo has decades of experience supporting manufacturers around the world with the technologies that power modern production environments. This expertise extends across many of the critical systems found throughout today's biopharmaceutical facilities, including:

- Process instrumentation and control
- Fluid handling and valve automation
- Bioprocess control systems
- Laboratory automation
- Robotics and motion control
- Digital manufacturing and Industry 4.0 technologies

Through Festo Didactic, we transform this real-world automation expertise into industry-relevant learning solutions that help educational institutions, workforce development organizations, and employers build the next generation of life sciences talent.

By combining automation technology, hands-on learning systems, curriculum, digital content, and industry expertise, Festo helps prepare learners for careers in:

- Biopharmaceutical manufacturing
- Cell and gene therapy manufacturing
- Laboratory automation
- Biotechnology research and development
- Quality control and analytical laboratories
- Process development and scale-up facilities
- Automation and controls engineering support



Process trainer 3531. Industrial instrumentation and process-control learning systems help learners develop practical skills in measurement, control, calibration, and troubleshooting.

Strengthen skills-based training programs in key technical areas

Festo Didactic transforms real-world biopharmaceutical and automation industry requirements into hands-on learning experiences that prepare the next generation of life sciences professionals. Festo Didactic builds on proven curriculum in automation, instrumentation, process control, fluid power, electrical systems, maintenance, and digital technologies. Working with educators and industry partners, these competencies can be adapted and integrated into learning pathways for biopharmaceutical manufacturing, bioprocessing, and laboratory automation.



Courseware
Ready-to-teach learning content available in workbooks or through our digital learning portal, Festo LX, combines foundational automation concepts with biopharmaceutical manufacturing applications. Learners develop an understanding of process control, laboratory automation, cleanroom protocols, data integrity, and regulatory requirements through curated theory, hands-on exercises, and clearly defined learning outcomes. The result is engaging, industry-relevant training that prepares students for careers in modern life sciences environments.

Learning systems
From laboratory automation trainers and process control systems to advanced bioprocess and manufacturing learning platforms, our industrial-grade training equipment brings real-world life sciences technologies into the classroom. Learners gain practical experience with the automation systems, instrumentation, and workflows commonly found in biotechnology, pharmaceutical manufacturing, quality control laboratories, and process development facilities—building the skills employers demand through authentic, hands-on learning.

Digital tools
Innovative educational technologies—including Festo LX, digital twins, simulation software, and immersive VR/AR learning experiences—help learners understand complex biopharmaceutical processes and automation systems in a safe, interactive environment. These tools support experimentation, troubleshooting, process optimization, and workforce readiness while reinforcing critical concepts related to manufacturing, laboratory operations, and regulatory compliance.

Training and support
Successful workforce development requires more than equipment alone. Through instructor training, certification programs, curriculum development support, industry consultation, and responsive technical services, Festo helps institutions build sustainable life sciences training programs. Whether launching a new biotechnology program or expanding an existing biopharmaceutical manufacturing pathway, our team provides the expertise and resources needed to maximize learner outcomes and long-term program success.

More than equipment: a complete program-development ecosystem



Workforce development
Seminars, programs, and train-the-trainer sessions enable working professionals to engage in lifelong learning and update their skills.

Certifications
Well-designed learning pathways help individuals cultivate specific skills and expertise that meet rigorous standards.

Training hardware
High-quality equipment such as learning factories, training packages, and learning systems enable practical experimentation.

Curriculum and learning content
A wide range of ready-to-use courses aligned to industry requirements guide learners through self-paced study and experimentation.

Partnerships
Our network of industry and educational partners provides our customers with cutting-edge technologies and facilitates knowledge sharing.

Digital tools
Our online portal Festo LX, simulators, data acquisition tools, AR and VR tools contribute to interactive and personalized learning.

Customized solutions
Upon request, our didactic engineers can customize learning solutions according to your specific requirements.

Support
In-house technical assistance, installation, and commissioning services optimize your investments.

From industry technologies to hands-on learning

Festo automation technologies support manufacturing, laboratory, and medical technology applications across the life sciences sector. Festo Didactic translates this experience into industry-informed learning environments that help educational institutions prepare learners for evolving technical roles.

The four industry areas could also identify their educational relevance:

- **Medical consumables production**: Motion, assembly, pneumatics, controls, and quality
- **Medical technology and device manufacturing**: Precision automation, robotics, inspection, and traceability
- **Laboratory automation and diagnostics**: Sample handling, motion control, software, and data integrity
- **Biopharmaceutical manufacturing**: Instrumentation, process control, bioprocessing, and batch operations



Transforming industry expertise into hands-on learning that prepare learners for today and tomorrow's industry needs.

Connecting industry competencies with education and career pathways

Developing the skills that power biopharmaceutical manufacturing

Core competencies

Regulatory & quality

- GMP
- GxP requirements
- Quality assurance
- Quality control
- Equipment qualification (IQ/OQ/PQ)
- Computer system validation (CSV)
- Change control
- Root cause analysis
- CAPA
- Documentation practices

Process & operations

- Process fundamentals
- Bioprocess fundamentals
- Upstream processing
- Downstream processing
- Batch operations
- Process optimization
- Fermentation
- Cell culture
- Purification
- Fill / finish
- Utilities systems

Automation & control systems

- PLC programming
- HMI operation
- SCADA
- DCS
- Process control
- PID control
- Robotics
- Motion control
- Industrial networks
- Control system troubleshooting
- Loop diagrams
- Electrical systems

Instrumentation & metrology

- Instrumentation fundamentals
- Sensors & transmitters
- Calibration
- Instrument troubleshooting
- Process, flow, pressure and temperature measurement
- pH / conductivity / dissolved oxygen principles
- Metrology
- Preventive maintenance

Maintenance & reliability

- Mechanical systems
- Pneumatics
- Hydraulics
- Electrical systems
- Troubleshooting
- Preventive maintenance
- Predictive maintenance
- Equipment maintenance
- Spare parts management
- Safety procedures
- Lockout / tagout / pH / conductivity / dissolved oxygen

Digital & data management

- MES
- LIMS
- Data integrity
- Data analytics
- Process monitoring
- Trend analysis
- Reporting
- OT/IT integration
- Cybersecurity awareness
- Electronic batch records
- Digital workflows
- Cloud-based systems

Applicable across biopharmaceutical careers

Process operator

Maintenance technician

Instrumentation technician

Automation & controls engineer

Validation specialist

Process development scientist

Quality assurance specialist

Manufacturing & operations leader

Metrology and calibration technician

PROFICIENCY LEVELS

FOUNDATION
Basic understanding of concepts and awareness of practices.

INTERMEDIATE
Applies knowledge to perform tasks with guidance.

ADVANCED
Applies skills and knowledge to solve complex issues.

EXPERT
Leads, optimizes, and drives continuous improvement.

Once target careers and competency requirements have been identified, institutions can combine curriculum, digital tools, and hands-on learning systems to create an appropriate education and training pathway.

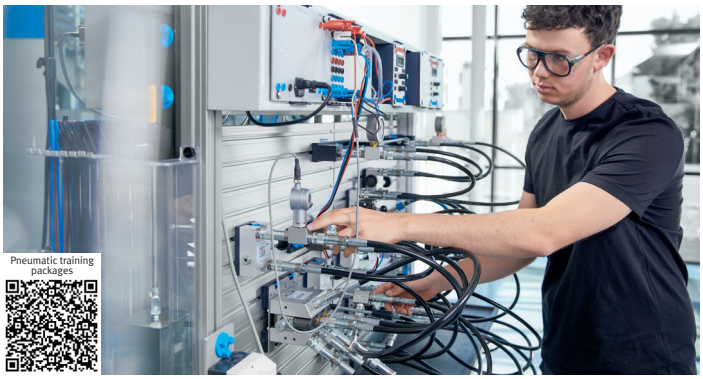
Build the technical foundation for biopharmaceutical careers

Biopharmaceutical manufacturing draws on multiple technical disciplines. These foundational learning systems help students develop the automation, instrumentation, mechanical, and troubleshooting competencies required before progressing into specialized bioprocess and laboratory applications.

Pneumatics and fluid power

Pneumatic actuators, valves, and vacuum technologies are essential throughout modern biopharmaceutical manufacturing, powering automated filling systems, material handling, single-use processing equipment, and packaging operations. Pneumatic control systems ensure the precise movement of products and components while supporting reliable, repeatable processes in cleanroom environments. Learners develop the skills needed to understand, operate, troubleshoot, and maintain pneumatic systems used throughout regulated manufacturing facilities.

→ Pneumatic training packages



Automation and electromechanical systems

Electromechanical systems form the backbone of automated biopharmaceutical manufacturing, driving conveyors, robotic handling systems, packaging equipment, and laboratory automation platforms. Motors, sensors, actuators, and control systems work together to ensure precise motion, product traceability, and reliable production. Through hands-on learning, students develop the skills required to install, operate, maintain, and troubleshoot automated manufacturing systems used across biotechnology and pharmaceutical production.

→ Electromechanical learning system

→ Stepper and servo motor control training package





Bioprocess control and instrumentation

Biopharmaceutical manufacturing depends on precise monitoring and control of critical process parameters such as temperature, pressure, flow, pH, dissolved oxygen, conductivity, and level. Industrial instrumentation and process control systems are fundamental to fermentation, cell culture, purification, clean utilities, and formulation processes. Learners gain practical experience with sensors, transmitters, control valves, and automated process control strategies that help ensure product quality, process consistency, and regulatory compliance..

→ Industrial process control learning systems

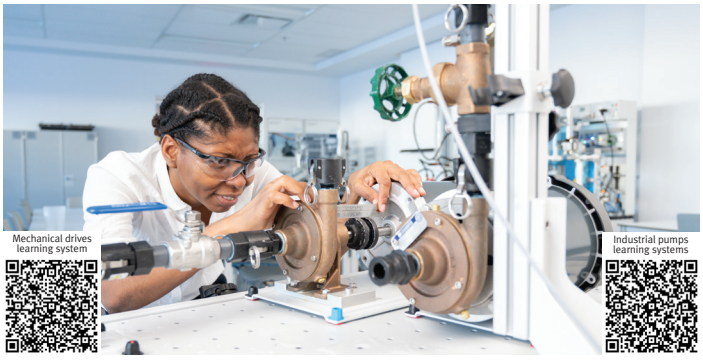


Mechanical systems and equipment reliability

Mechanical systems are fundamental to the operation and maintenance of biopharmaceutical manufacturing equipment, including pumps, mixers, agitators, conveyors, filtration systems, and fluid handling equipment. Developing mechanical maintenance and troubleshooting skills enables technicians to improve equipment reliability, minimize downtime, mitigate risk, and support continuous production in highly regulated manufacturing environments.

→ Mechanical drives learning system

→ Industrial pumps learning systems



Bring realistic laboratory automation into the classroom

The Compact Lab Automation Kit provides a flexible platform for developing hands-on learning activities aligned with an institution's curriculum, target occupations, and regional industry needs. This hands-on training system teaches laboratory automation, sample handling, and process control for biotechnology, pharmaceutical, and analytical laboratories. Combining hardware with workflow exercises in a compact platform, it lets learners practice tasks and concepts encountered in regulated lab environments.



The kit provides practical, job-ready experience with technologies and workflows used in R&D, analytical testing, quality control, and biopharmaceutical labs, and supports learning of emerging software tools such as Python. It prepares new and incumbent staff to implement, operate, and optimize automated workflows in regulated environments.

Key features and learning outcomes:

- Practical experience with automation technologies and workflows common to R&D, quality control, analytical testing, and biopharmaceutical labs.
- Hands-on sample handling exercises that mirror routine laboratory processes (e.g., automated pipetting, plate handling, sample transfer).
- Process control and sequencing practice to build understanding of how automated methods are designed, validated, and executed.
- Exposure to software-driven automation and emerging tools, including scripting with Python for instrument control, data handling, and workflow automation.
- Emphasis on regulatory considerations and quality system awareness relevant to highly regulated labs, enabling learners to work within compliance requirements.

Target learners and impact:

- Students and new hires: acquire job-ready skills to introduce and operate automation in laboratories that still rely on manual methods.
- Incumbent technicians and scientists: upskill to implement, optimize, and maintain automated workflows, improving throughput, reproducibility, and compliance.

Overall, the kit bridges theoretical knowledge and practical capability by delivering hands-on training in the technologies, software, and quality practices needed to modernize laboratory operations.

As laboratory automation continues to expand across the life sciences industry, the Compact Lab Automation Kit provides a scalable platform for developing the next generation of laboratory technicians, scientists, and automation specialists.

Explore laboratory automation applications and workflows

Application area: sample management
Effective sample management is critical to laboratory productivity, regulatory compliance, and data integrity. Using the Compact Lab Automation Kit, learners can simulate and automate key sample management processes, including:

- Sample registration and identification
- Barcode generation and scanning
- Sample tracking throughout the workflow
- Chain-of-custody documentation
- Storage location management for racks, shelves, and freezer systems
- Traceability and electronic record management

These exercises help learners understand the importance of maintaining sample integrity and ensuring complete traceability throughout the testing lifecycle.





Application area: reagent preparation
The system also supports automated reagent preparation workflows commonly found in quality control, analytical, and research laboratories.

Learners can perform tasks such as:

- Preparation of buffer solutions and analytical standards
- Automated dispensing of reagents
- Recipe and process management
- Integration with laboratory devices and instrumentation
- Preparation of samples and reagents for analytical testing

By automating routine preparation tasks, learners gain experience with the methods laboratories use to improve consistency, reduce variability, and increase operational efficiency.

Benchtop bioreactor training system

Scalable and modular platform for bioprocess education, research and process development.



Vessel sizes 0.2 to 10 L

Stainless steel or glass

Festo automation technology

Advanced process control & analytics

Scalable up to 6 vessels

Developed through collaboration between Festo Brazil and bioSINK Engineering, the labSINK™ Benchtop Bioreactor provides a configurable platform for bioprocess education, research, and process development. Designed for laboratory education and R&D environments, the system enables learners to gain hands-on experience with the same technologies used throughout biotechnology and biopharmaceutical manufacturing facilities.

Available in vessel sizes ranging from 0.2 to 10 liters and constructed from either 316L stainless steel or borosilicate glass, the system integrates critical bioprocess instrumentation including pH, dissolved oxygen, temperature, aeration, agitation, and automated dosing control. Advanced configurations support automated mass flow control for multiple gases, real-time process monitoring, and comprehensive data acquisition for microbial, cell culture, and phototrophic applications.

Powered by Festo automation technology, the modular control platform can independently manage up to six vessels while providing an intuitive HMI, recipe management, process traceability, and advanced analytics. Learners gain practical experience with process control, instrumentation, sensor integration, data analysis, and bioprocess optimization within a realistic laboratory environment.

In addition to technical skill development, the training system helps prepare learners for Good Manufacturing Practices (GMP) environments by reinforcing the importance of process consistency, documentation, traceability, and regulatory compliance. The Didactic focus emphasizes proper operation and maintenance of the bioreactor to ensure optimal performance, reliability, product quality, and mitigate risk—key competencies required in regulated biopharmaceutical manufacturing settings.

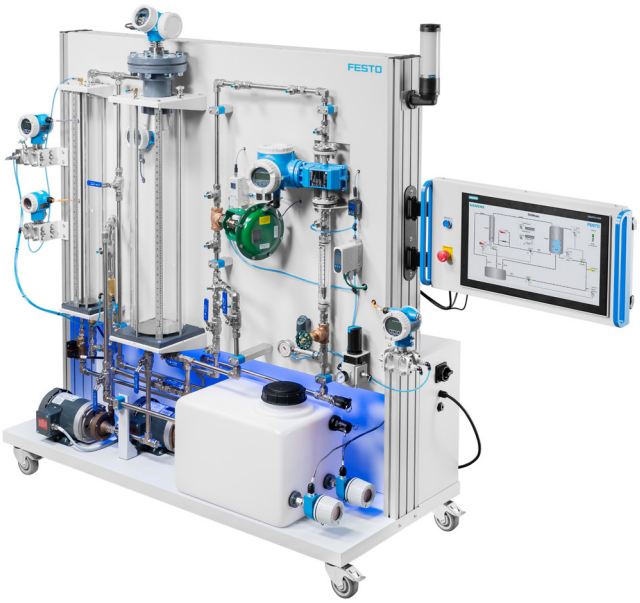
As a natural progression from foundational process control and instrumentation training, the Benchtop Bioreactor bridges the gap between automation fundamentals and real-world biopharmaceutical manufacturing applications, preparing students and technicians for careers in bioprocess development, biotechnology research, and advanced biomanufacturing operations.

Outcome: Learners gain the technical, operational, and regulatory competencies required to support modern biopharmaceutical manufacturing—from laboratory-scale process development to automated production environments.

Advance from instrumentation fundamentals to integrated DCS operation

An interactive, connected process plant for your laboratory.

→ Video



Discover a structured way to integrate real-world DCS training into modern process automation programs.

This training unit provides hands-on instruction in measurement, instrumentation, and control, from basic to advanced, using IIoT-enabled components and a cloud-based distributed control system (DCS) that allows for remote system operation.

After developing foundational skills in measurement, instrumentation, and individual control loops, learners can progress to integrated process operation using a modern distributed control system.

Benefits

- Interactive and safe training unit for extensive hands-on experimentation with real process loops.
- High industry relevance with dual-media design and a wide range of components and technologies.
- Fully assembled, wired, and integrated with SIMATIC PCS neo for quick, hassle-free setup.
- Ready-to-use instructional materials for faster curriculum enhancements.
- Fault-insertion capability to develop problem-solving and decision-making skills.

The learning system provides all the equipment needed to **control water pressure, flow, and level, monitor temperature, and control air pressure and flow** using water and air as safe media. It supports single-loop control as well as cascade, batch, and multivariable interactions—covering everything from basic PID concepts to the dynamics of interacting loops and stepwise process sequences.

The **mobile, rugged process workstation** features 316 stainless steel piping, two acrylic columns, a bubbler tube, a tank, and two centrifugal pumps (with different capacities) with variable-frequency drives.
It includes manual valves (ball, globe, check), pneumatic actuators, proportional pressure control valves, pneumatic actuator globe valve, angle-seat control valve with a pneumatic actuator, solenoid valve, and 22 pressure measurement ports. A manometer and rotameter monitor flow and pressure.

Smart instrumentation includes a pressure switch, differential pressure transmitters for flow and level, temperature transmitters, magnetic flow transmitters, and radar level transmitters with remote display.

Electrical components are housed in a rear cabinet. Communication technologies include PROFINET, PROFIBUS, IO-Link, HART, Modbus TCP, Ethernet-APL, WLAN, Bluetooth, and Heartbeat.

All components are seamlessly integrated with SIMATIC PCS neo from Siemens, accessible through the HMI or a web browser for remote monitoring and operation. Advanced data visualization tools and built-in test and simulation features help learners develop strong expertise in process automation.

Outcome: Hands-on experience with a DCS builds a solid, real-world foundation for Life Sciences careers, enabling learners to understand, operate, and troubleshoot automated processes with confidence.

Ready to advance your training programs and facilities?



Get your project off to a strong start!

Do you have questions or are you looking for professional advice and inspiring ideas? Our didactic experts will help you design an optimal environment to make learning (and teaching) efficient and engaging, matching your training, space, and budget requirements.

Maximize the return on your investments: benefit from personalized advice, room planning, certification programs, train-the-trainer sessions, commissioning and repair services, and more.

Book your free personalized consultation:

→ **marketing.didactic.us@festo.com**

Disclaimer: The training program and equipment mentioned in this document may not be available outside of the USA. Please verify with a Festo Didactic representative or an authorized dealer.

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