The Curriculum Industry 4.0

Learning Paths from Fundamentals to Industry 4.0

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The Impact of Industry 4.0 Education

Changing Industry Needs

The world is undergoing a process of permanent and ever faster changes. We all see the effects in our environment, society, economy, and in our industry. To not only keep up with, but to drive those changes, we need innovative companies to push productivity and growth for a prosperous and sustainable world. But implementing new technologies is only half the story, because it requires qualified employees who know how to apply and shape them. In fact, a well-trained workforce is the decisive quality factor in modern industrial manufacturing.

Technical Education is key

Technical education, both for young people in technical vocational education and training and in higher education as well as for professionals through lifelong learning, ensures building up the necessary skills and competencies for a successful industrial production. Knowledge transfer aligned to industry needs helps curb youth unemployment, fosters reskilling of the workforce and ensures human and economic development. Therefore, technical education is key to success.

Learning Solutions by Festo

Festo is a global player in Industrial Automation. Within the Festo group, Festo Didactic provides innovative solutions in technical education. As member of numerous international networks, the intense exchange with industry experts, educational entities, public authorities, and research institutes allows precious insights into both, state-of-the-art technology developments and the education market. Given this expertise, we are developing the Curriculum Industry 4.0 to prepare learners for the digital work in a future-oriented industrial environment.

The Curriculum Industry 4.0

A Curriculum in general is a qualification plan for the education of people, based on a theory of teaching and learning. In a technical education environment, the aim is to train the necessary technologies and competencies at vocational education schools or higher education institutes to qualify future experts for industrial jobs.

Competencies in Transition

Being aware that technological know-how changes from year to year, young people as well as professionals need to update their skills on a permanent basis. As a globally networked education partner with industrial DNA, we translate current and future competency requirements from industry and educational institutions into competency diagrams that make these changes visible and help educators to identify necessary qualification needs. The competency diagram of a mechatronics technician, for example, indicates that new technologies and soft skills expand ever more in comparison to the traditional mechanical engineering and automation fundamentals. Furthermore, a noticeable shift towards information technology is evident.

Why a Curriculum I4.0?

Skills gap

Technological innovations quickly find their way onto the shop floor of industrial manufacturers. These changes in industrial practice pose challenges to employees in terms of new methods, tools, and applications. However, embedding these new competency requirements into educational curricula takes time and can't keep up with the rapid pace at which new technologies are emerging. Combined with a lack of professional training, a skills gap emerged, which refers to a difference between the skills that industry demands and those that employees actually possess. With the Curriculum Industry 4.0, we envision to fill the skills gap. Our Curriculum allows for sustainable skills development for various job profiles in today's Industry 4.0 manufacturing and will thereby contribute to ensuring the employment of people in the industrial sector.

Learn more about competency-based qualification in vocational training and higher education:

Our Focus

Important job profiles

A job profile is a description of the exact tasks of a particular job and of the skills, experience, and personality a person would need to do the job. Changes in technology consequently influence the job profiles of technicians and engineers. The Curriculum Industry 4.0 mirrors these changes and allows to select appropriate learning content for various job profiles in modern industrial manufacturing.

Focus job profiles in vocational education
- Mechatronics Technician
- Industrial Electrician
- Industrial Mechanic
- IT Specialist

Focus job profiles in continued education
- Maintenance Technician
- Automation Engineer
- Data Scientist/- Analyst
- Production Specialist

Exemplary presentation of the required competencies for the job profile **mechatronics technician**.

■ Former competencies
■ Today's competencies
≡ Skills gap

Softskills
Organization
Specialization
Electronics
IT
Mechanics

Social Competencies

The four Cs model
Next to technical know-how, also social competencies are vital in work life. The four Cs model formulates competencies that are of paramount importance for learners in the 21st century: Communication, Collaboration, Creativity and Critical Thinking. The four Cs model picks up the changes in the industrial working environment and facilitates problem solving by collective intelligence. Our Curriculum I4.0 provides the framework for developing these very competencies.

Critical Thinking / Problem Solving

Cs

Collaboration

Creativity

Communication

Centerpieces of the Curriculum Industry 4.0
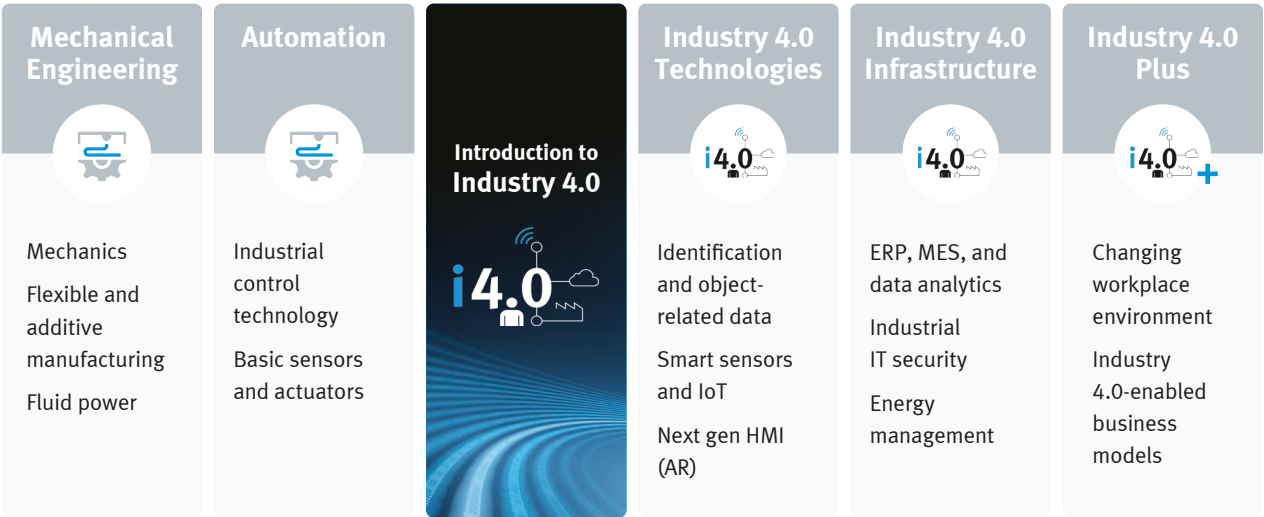
Learning Paths

A learning path is a meaningfully arranged sequence of learning courses and indicates the way each learner goes. The composition of a learning path is based on job-profile specific competency requirements and the associated industry relevant content topics.

eTheory Course   eLab Course   Evaluation   eLearning Course   eLab Course   Evaluation
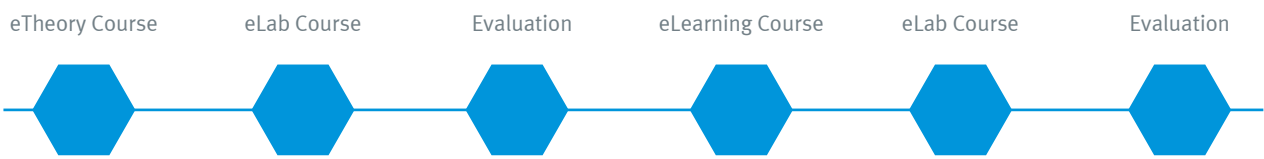
The Landscape of Learning Content

The learning content landscape is the overview of all state-of-the-art content topics for which we provide learning courses. The landscape includes both, fundamentals and complex Industry 4.0-related topics.
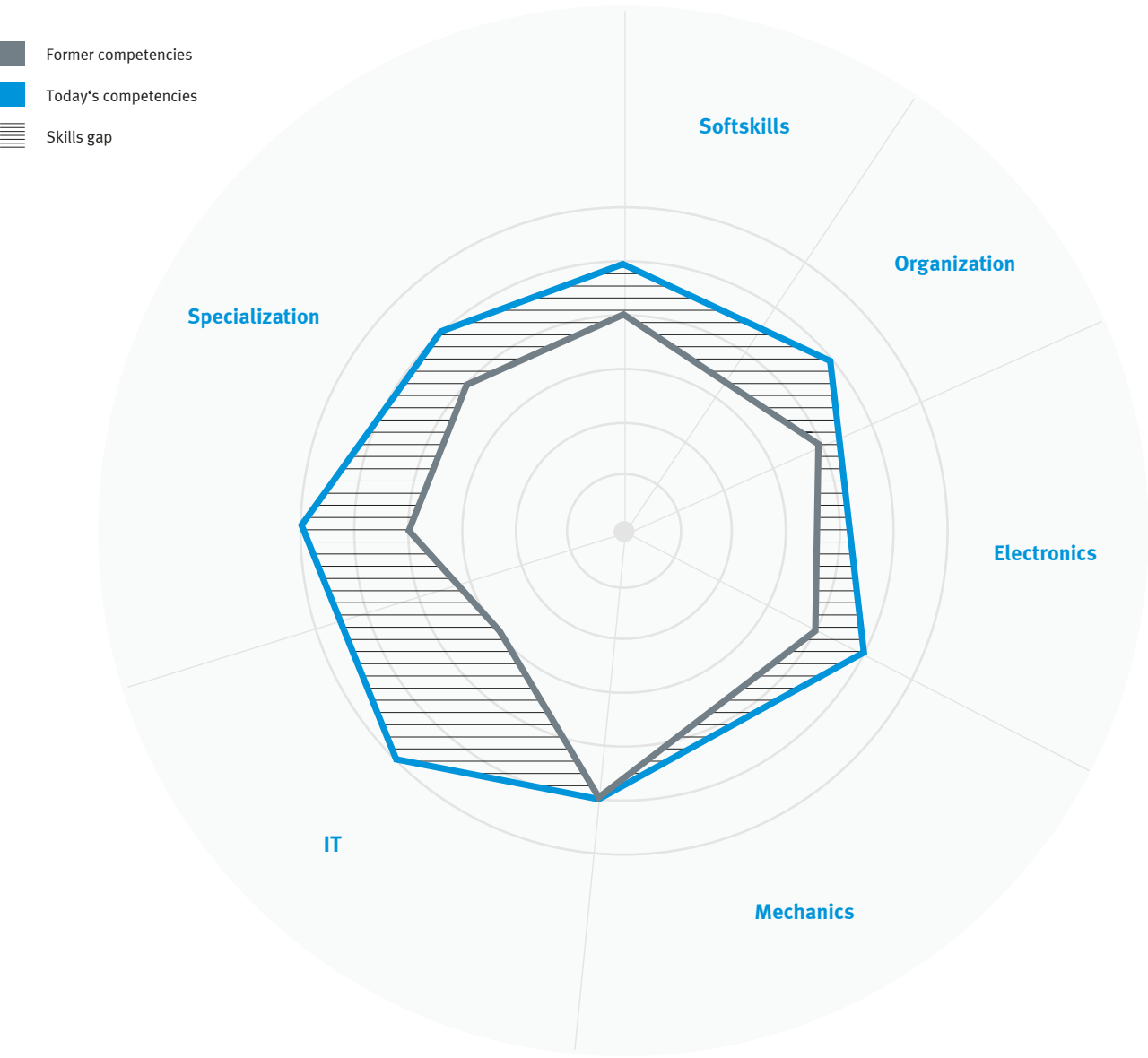
By its design, the Curriculum I4.0 also allows to develop so-called soft skills since they are considered immensely important to be well prepared for the challenges of today's industrial working environment.

Mechanical Engineering	Automation	Introduction to Industry 4.0	Industry 4.0 Technologies	Industry 4.0 Infrastructure	Industry 4.0 Plus
Mechanics	Industrial control technology	i4.0	Identification and object-related data	ERP, MES, and data analytics	Changing workplace environment
Flexible and additive manufacturing	Basic sensors and actuators		Smart sensors and IoT	Industrial IT security	Industry 4.0-enabled business models
Fluid power			Next gen HMI (AR)	Energy management	

From fundamentals to complex Industry 4.0 topics
Technical education begins with basic technologies, such as mechanical engineering and industrial automation-related topics. Having acquired this fundamental know-how, learners can move on to more advanced Industry 4.0 topics necessary for their specific job profile.
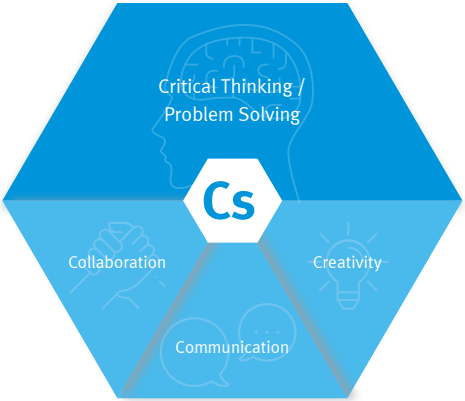
Flexible and modular knowledge transfer
Depending on the vocational or continued education job profile, both basic technologies and Industry 4.0-related topics need to be trained at different levels of detail. A Data Scientist, for example, only needs basic mechanical skills, whereas a Maintenance Technician will dive deeper to reach an expert level. Our Landscape of Learning Content allows to flexibly choose the required contents and thus ensures an individual fit.

The Curriculum of a Mechatronics Technician

The Mechatronics Curriculum is based on two predefined learning paths – mechanical engineering fundamentals as well as automation fundamentals. Beyond that, educators can choose from a wide array of Industry 4.0 relevant topics related to connectivity and communication, IT security and PLC programming, artificial intelligence, or energy management from the Landscape of Learning Content to enrich their individual teaching process.

AR
Know functions for maintenance tasks

HMI
Set up and functions, commissioning, and analyzing

AI and Machine Learning
Interpret neuronal nets and know algorithms

IIOT Retrofitting
Transfer possible scenarios, derive measurements

RFID
Know industrial application and develop troubleshooting

Additive Manufacturing
Know about modern manufacturing concepts and tools

MES
Interpret data, know system and communication interfaces

Fluid Power
Know everything about industrial components in pneumatics and hydraulics

Actuators and Sensors
Know design and function of sensors and actuators

PLC
Realize configuration of devices and implement technologies like RFID or MES

Robotics
Control an autonomous mobile robot

Predefined Learning Paths

Mechanical Engineering Fundamentals
Start learning the fundamentals of mechanical engineering step-by-step by building your own stack magazine from the ground up.

Automation Fundamentals
Continue by exploring the basics of automation and mechatronics.

Landscape of Learning Content

I4.0-related Technology Topics
Acquire additional skills focusing on I4.0-related technologies specifically relevant for your workplace environment.

I4.0-related Infrastructure Topics
Understand and master a full blown I4.0 manufacturing system and infrastructure-related topics crucial for your job and employability.

The Curriculum I4.0 can be accessed via Festo LX, the digital learning portal for customized learning experiences in technical education. Festo LX is based on multimedia learning nuggets that can easily be adapted and combined to form individual learning paths.
Learn more on lx.festo.com.

In general, we follow two basic principles within the framework of the Curriculum I4.0:
- The learning content covered is conveyed vividly using our learning systems in order to establish practical relevance and thus ensure real competency in action.
- The complexity of the learning content increases successively. Initially, only individual hardware components are considered, only later the overall networked system.