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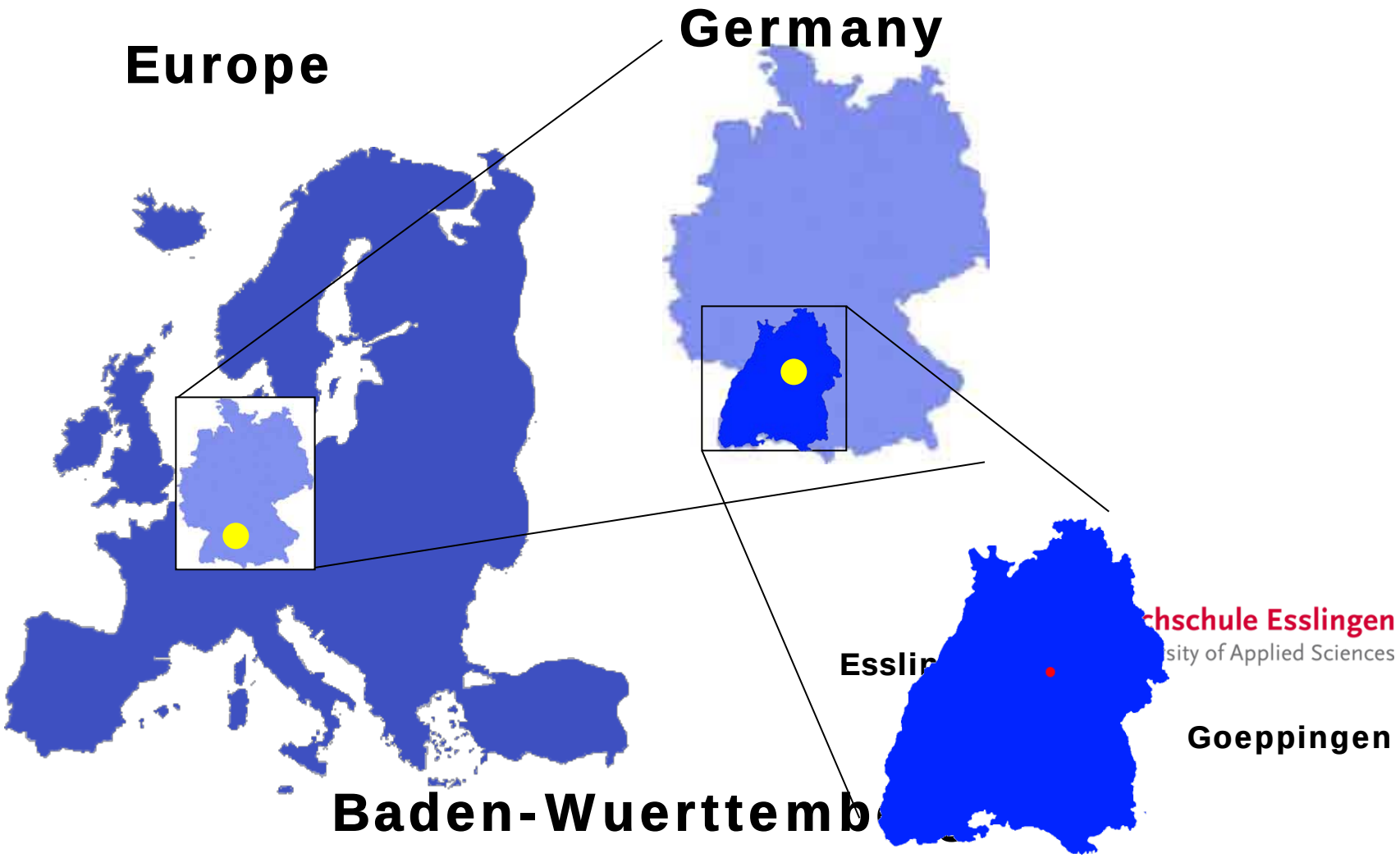
Integration of Industry 4.0 in Education Programs of German Universities of Applied Science

Prof. Dr.-Ing. Rainer Würslin

Agenda

- The University of Applied Sciences Esslingen
- The German Education- and Study-System
- Industry 4.0
- Education Requirements and Solutions for Industry 4.0

Location



Campuses

City Campus

- Automotive Engineering
- Basic Sciences
- Building Services, Energy and Environmental Engineering
- Mechanical Engineering
- Natural Sciences

approx. 2300 students

Hilltop Campus

- Graduate School
- Information Technology
- Management
- Social Work, Health and Nursing

approx. 2300 students

Göppingen Campus

- Engineering Management
- Mechatronics and Electrical Engineering

approx. 1200 students

Study Program in Mechatronics

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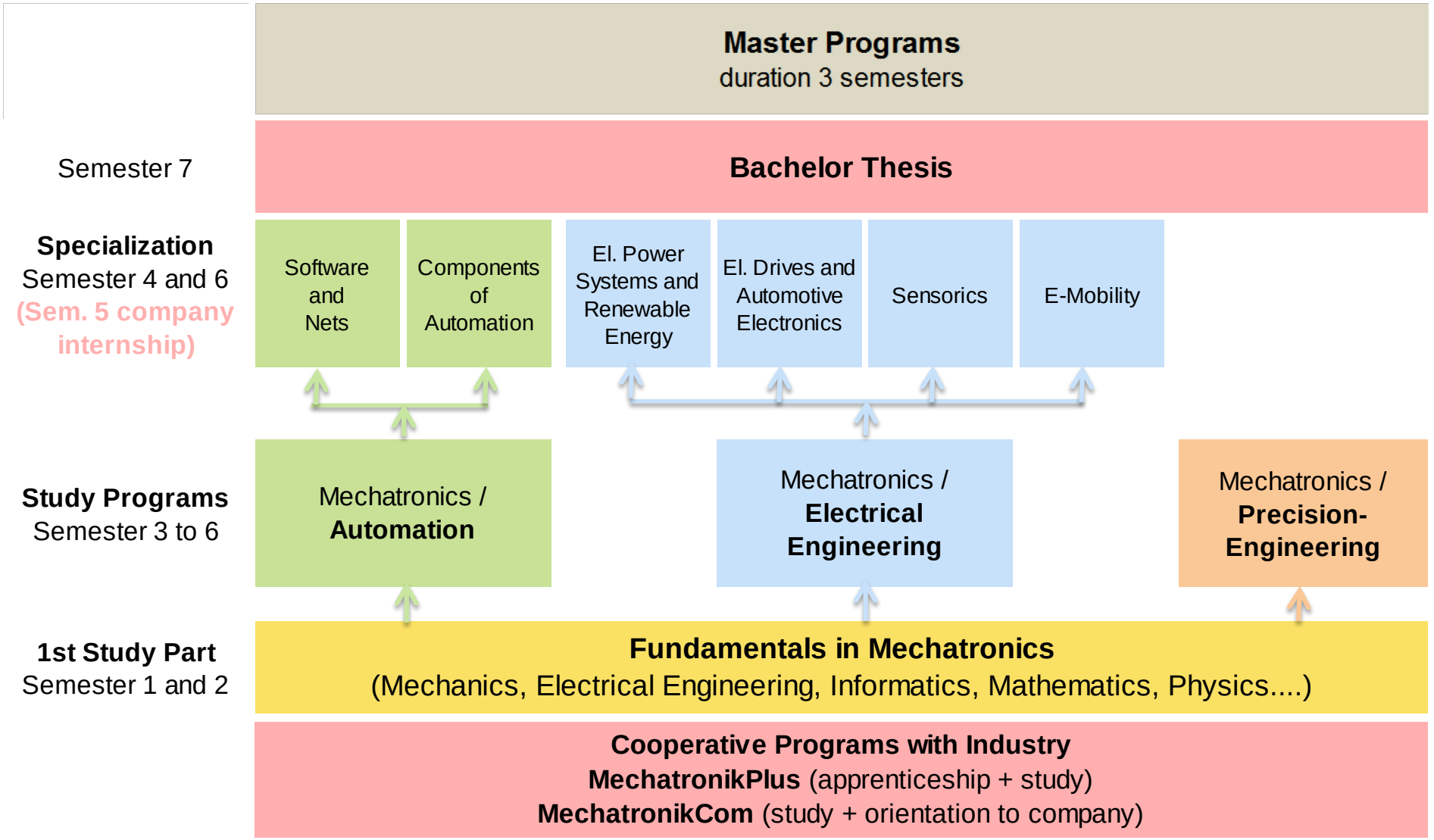

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The German Education- and Study-System

From Secondary School into the Job

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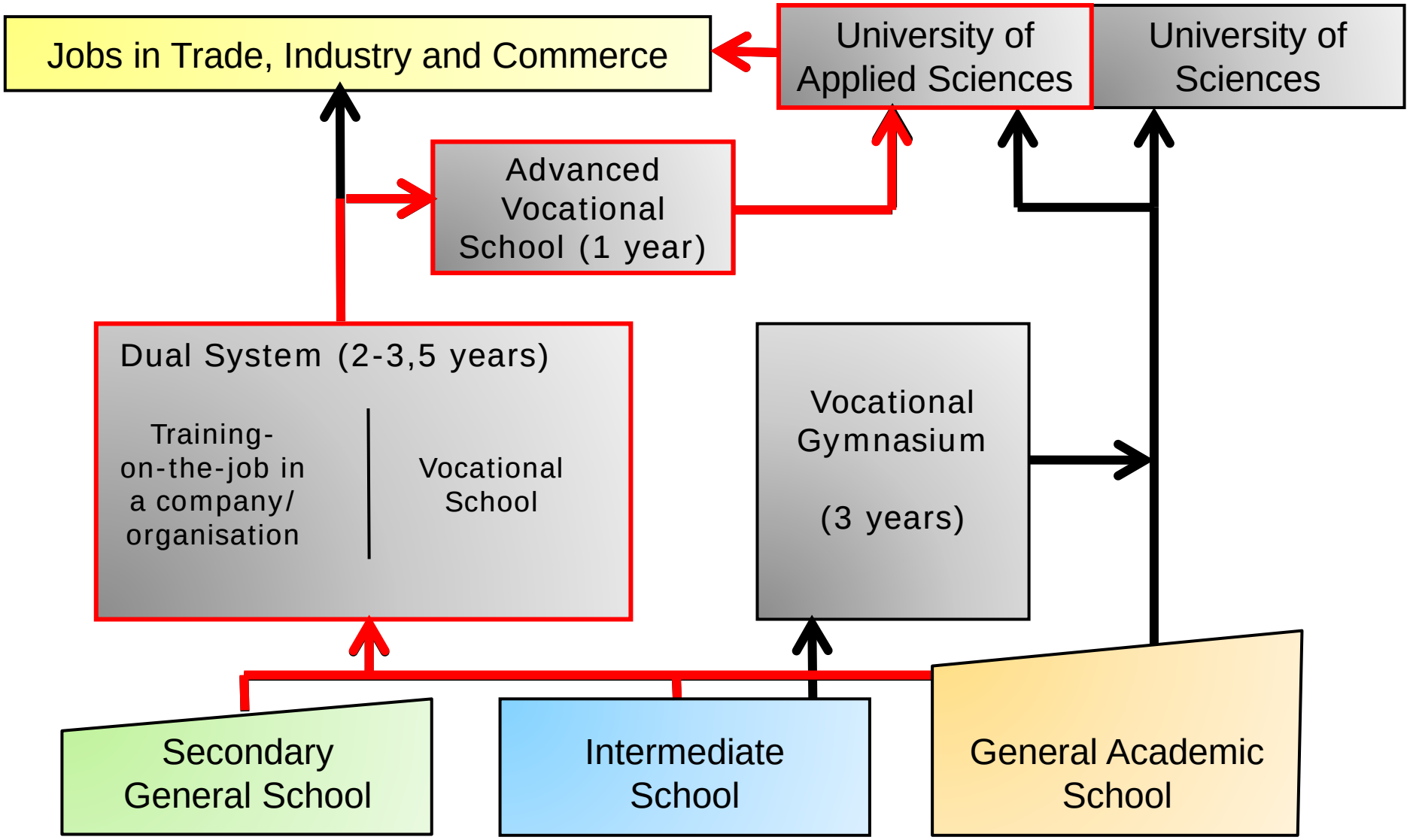

Different Kinds of Universities in Germany

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University of *Cooperative Education* (Duale Hochschule)	University of *Applied Sciences* (Fach-Hochschule)	University of *Sciences* (Universität)
• small classes • fixed timetables • oriented to practical experience • students are employees of the companies	• small group classes per semester • fixed timetables • students starts with practical experience • theory and practical education	• big classes into the first semesters • liberal structure of study program • academic education with theoretical emphasis

• practical training:
  • half the time in company
	• practical training:
	  • labs and projects during the study
	  • 1 Sem. industrial internship
	  • thesis 6 month in industry
		• practical training:
		  • labs during the study
		  • 12 weeks industrial internship

• degrees:
  • bachelor of engineering
  • master of engineering
	• degrees:
	  • bachelor of engineering
	  • master of engineering
	  • PhD possible in cooperation
		• degrees:
		  • bachelor of science
		  • master of science
		  • PhD

Features of the University of Applied Sciences program

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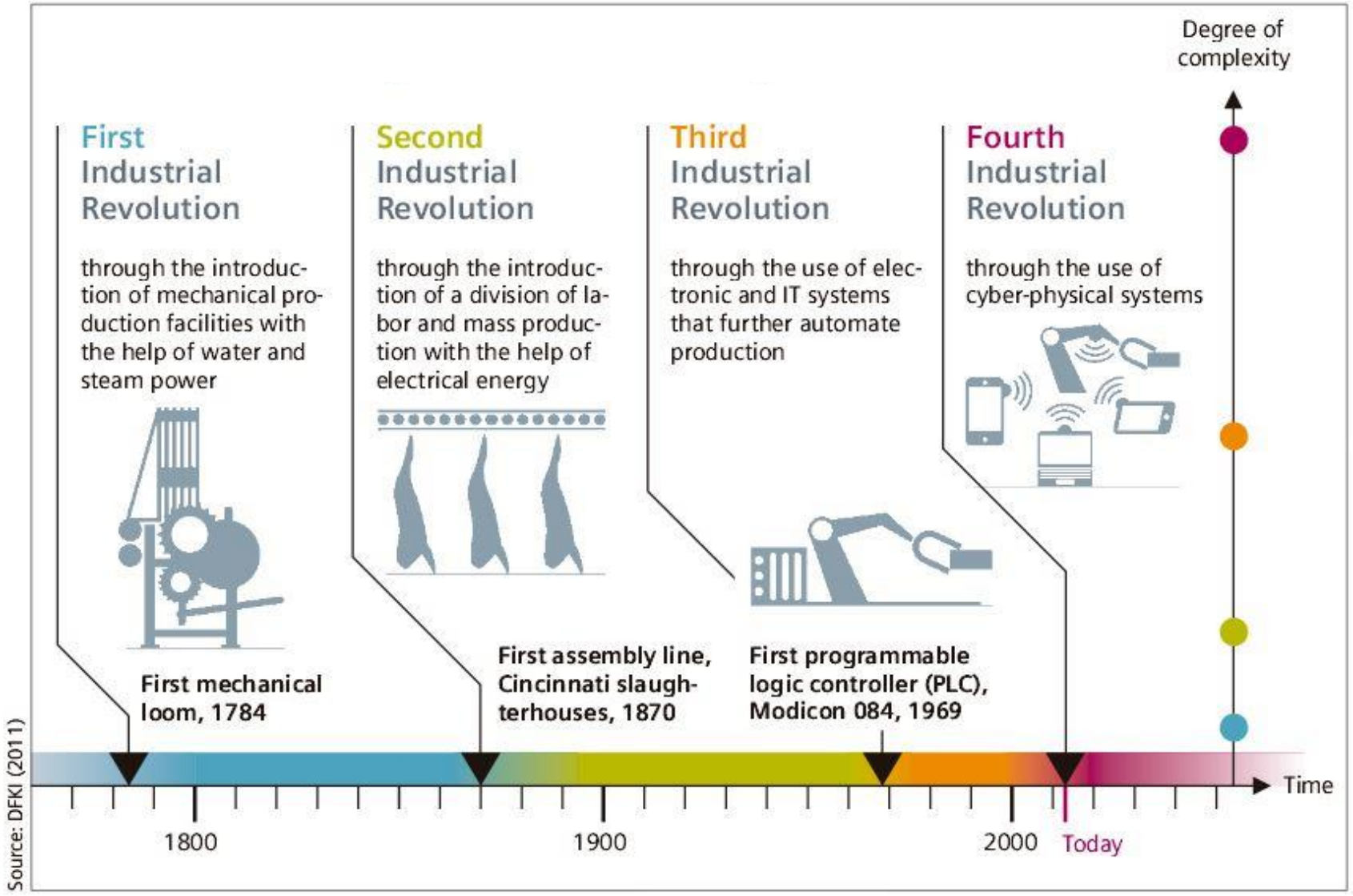
- Focus on Bachelor- and Master Programs of **Engineering**
- Professors with industrial experience
- Additional lecturers from industry

- Institutes of applied research and Steinbeis-Centers
- Students starts with industrial experience
- Students gets international experience

- Practical internship 100 days in industry
- Final thesis in industry (6 month)
- Good job prospects for students

Industry 4.0

From Industry 1.0 to Industry 4.0



Some facts to Industry 4.0

- Movement toward
  - Internet of things and services into production
  - Cyber Physical Production Systems (CPS)
  - Smart Factories

- The goals of production are:
  - controlled by the product
  - self-organizing
  - flexible

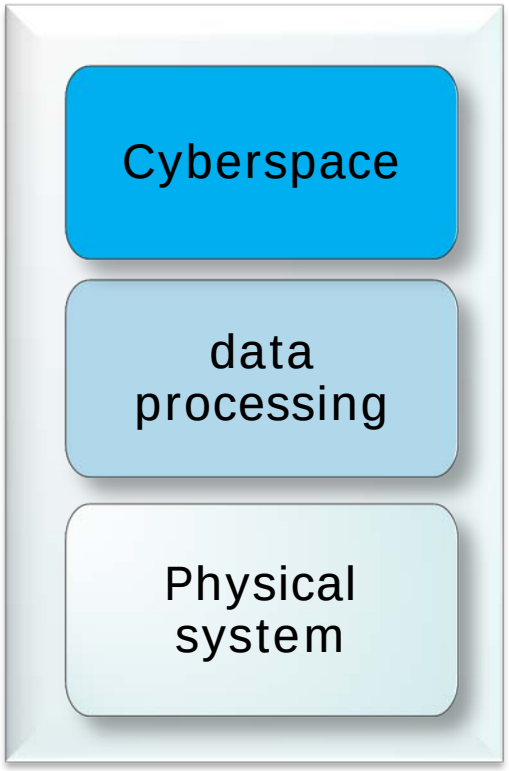
- Obstacles:
  - increasing number of variants
  - shorter development- and sales times
  - Individualisation of products

Cyber Physical Systems (CPS)

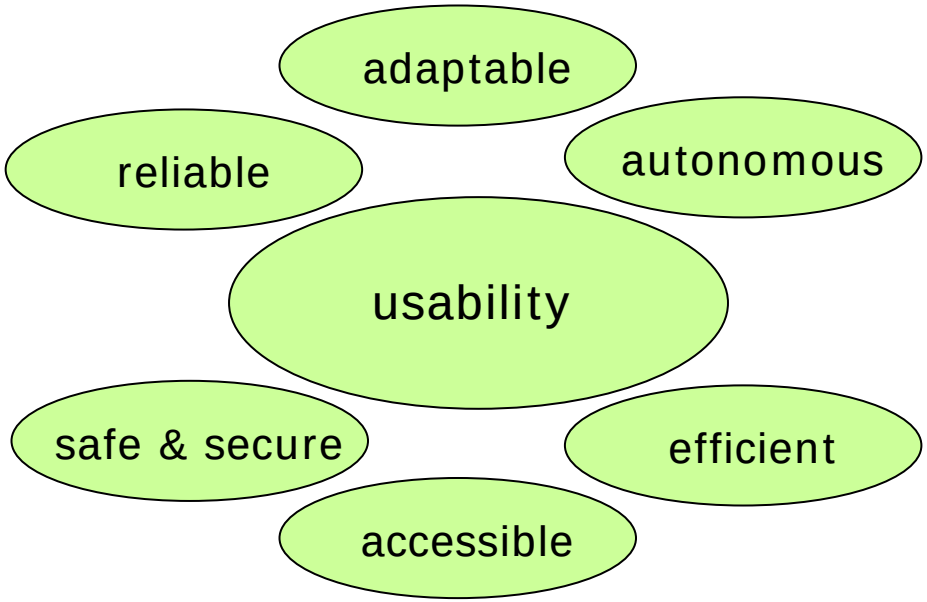
Structure

e.g.:
monitoring/
control/
application, etc..

e.g.:
actuator/sensor/
embedded system



Features



Reference IAO

Smart factory: organizes itself

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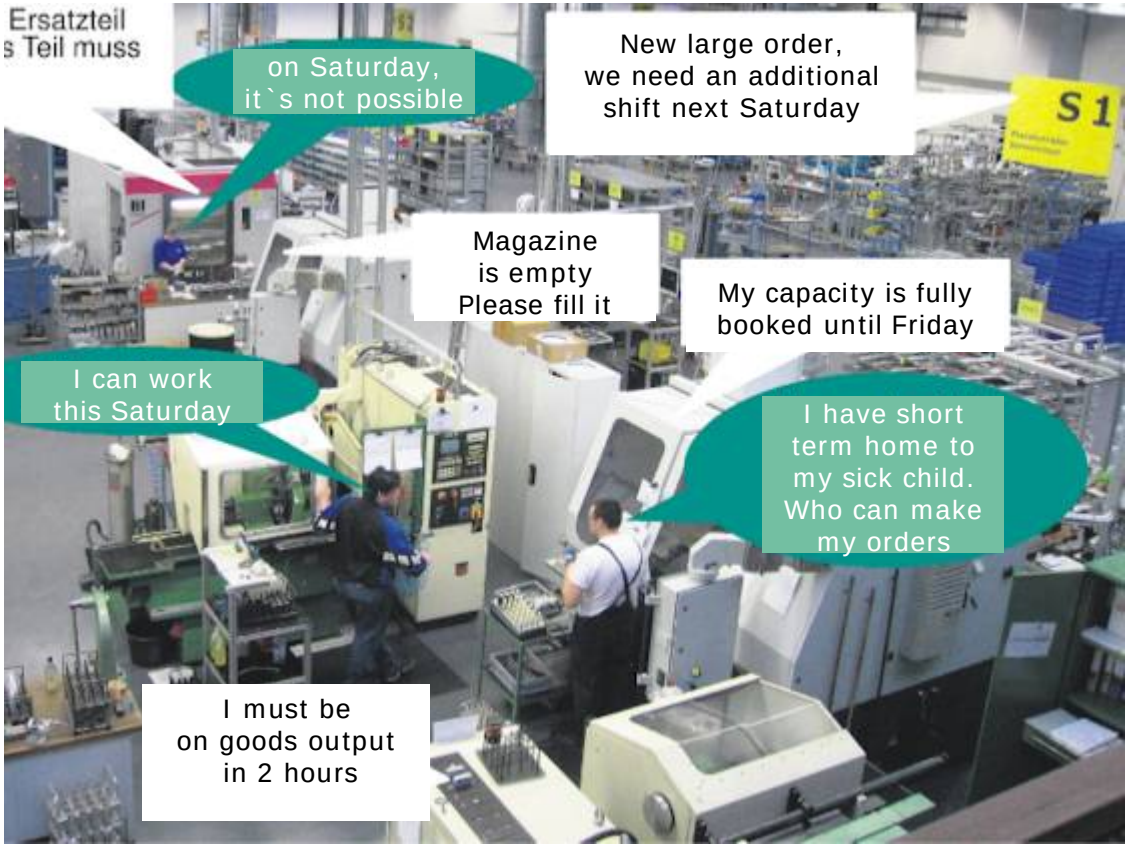

Quelle: VDI / Fraunhofer IAO

Cyber-physical systems (e.g., machinery, equipment)

- have an identity
- communicate with each other and with the surrounding environment
- configure itself (Plug and Produce)
- store information

decentralized self-organization

Areas of action

- Norms and Standards
- Revolution of ICT in manufacturing - an infrastructure for information, production and communication technology
- Safety and Security
- Human-machine interaction (HMI)
  - Operational work organization and job design
  - Qualification, education and further education
- Legal Framework
- Preliminary recommendations for the implementation of dual strategy

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Education Requirements for Industry 4.0

- Knowledge topics:
  - for norms and standards in communication technology
  - for a new production logistics and production infrastructure
  - Topics for Safety and Security
  - Specialists for human-machine interaction
  - Modeling of technical systems using information technology
    - interaction between the real and digital world
    - model-based, mechatronic engineering
    - adapting development (Delta Engineering) in contrast to full development

Requirement profiles for operators for Industry 4.0

- Augmented Operator
  - Control and monitoring of manufacturing processes with the help of virtual production systems
  - Influencing production targets (Situational and context-dependent)
  - Operation of IT-based assistance systems
  - Remote Maintenance and remote control of production lines

Education trends in Germany

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- companies in future will be education-partners of universities
  - compressed undergraduate study program
    + supplemented by business practice
    + depth studies
  - Knowledge not only in engineering,
    also in not technical skills
- Increasingly interdisciplinary skills are required
- New approaches to work-related knowledge and skills acquisition
- Development of digital learning techniques and digital Media (e-learning)
- Demographic change and heterogeneous requirements of learners require new approaches in didactics

Our way:
in the faculty mechatronics

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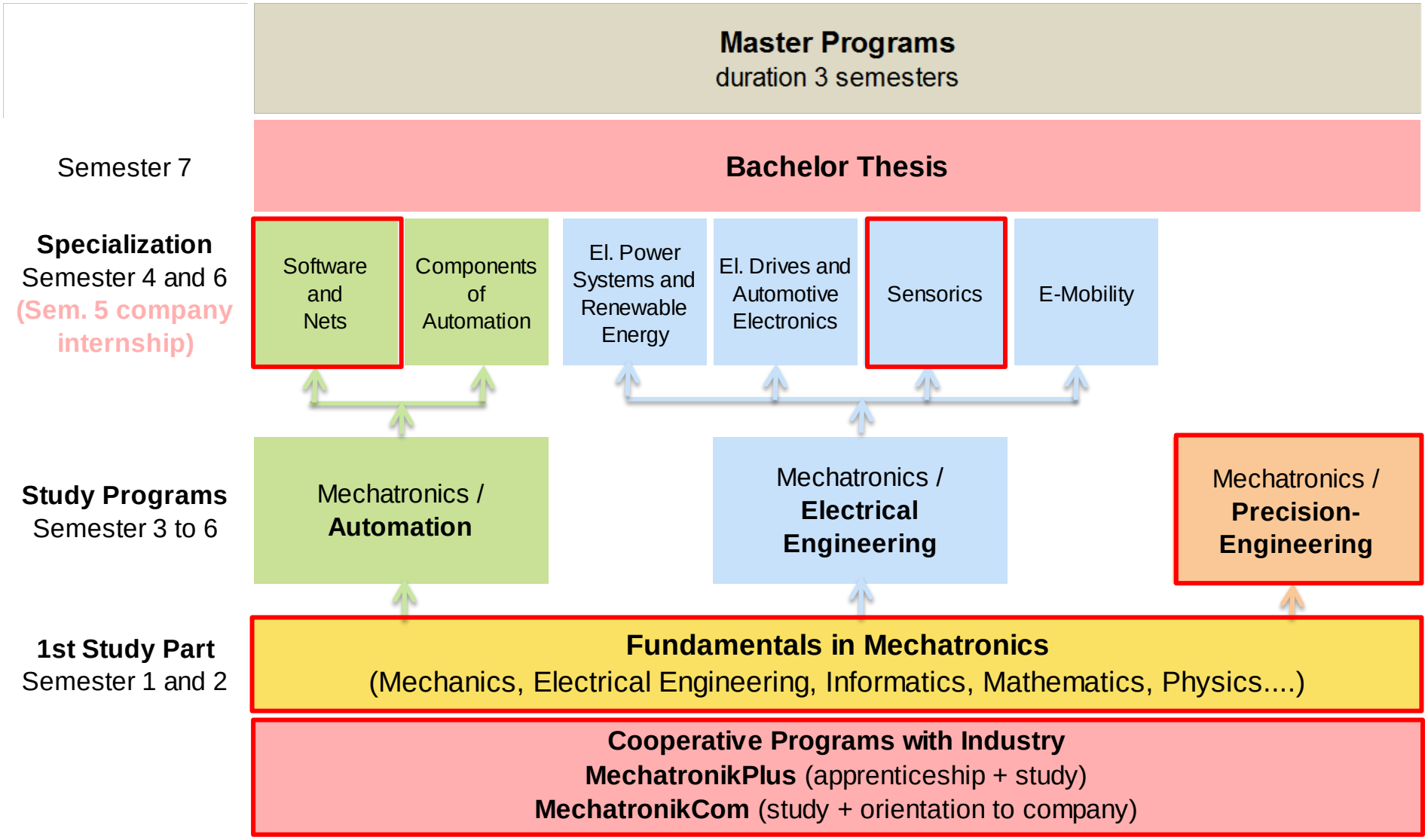

Education in Industry 4.0 in the Automation Lab

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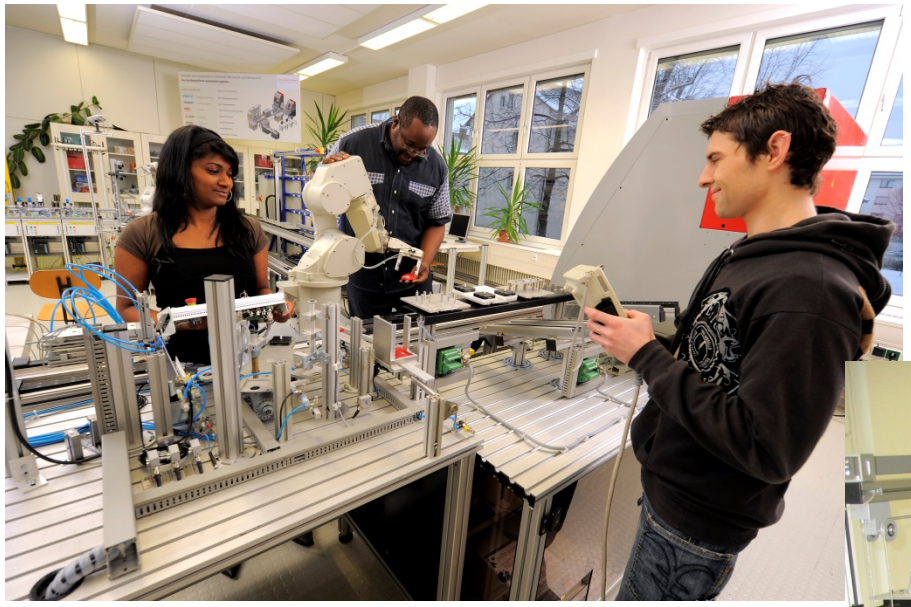
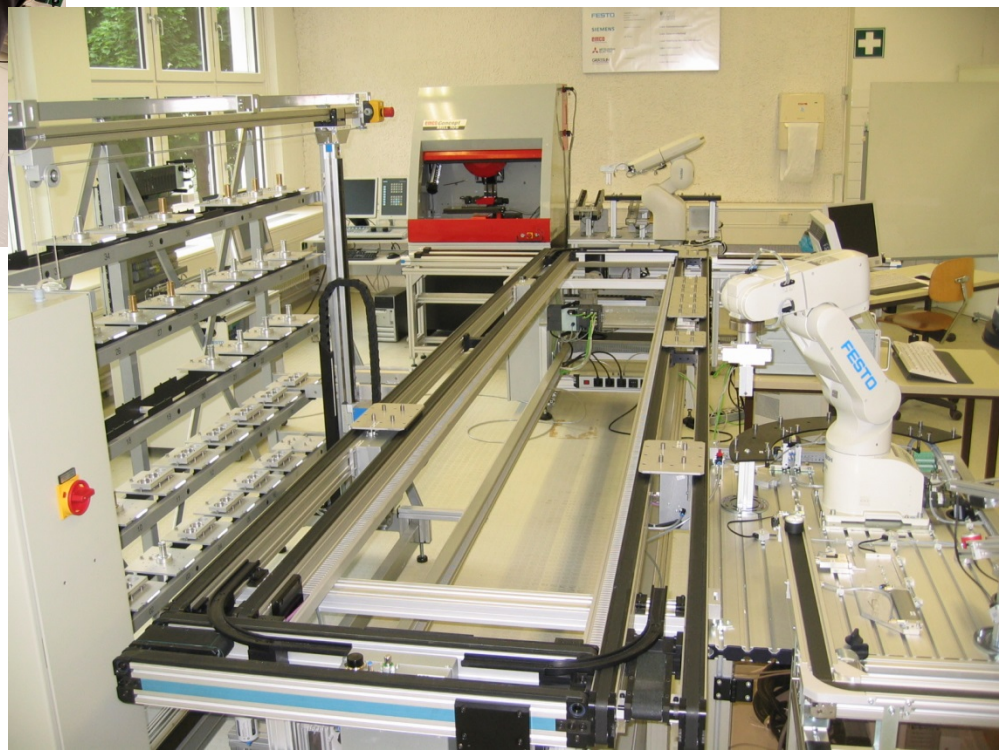


SIEMENS

FESTO



Thank you for your attention