Certificate Courses + Inhouse Programs
Engineering & Management

Smart Automation Expert
Six Sigma
Chief Technology Manager
Life Cycle Assessment
Industry 4.0
and many more

The Academy for Further Learning of RWTH Aachen University
> 300 laboratories

> 1000 certificates p. a.

60 employees of RWTH International Academy

> 200 experts (lecturers & professors)
Dear Ladies and Gentlemen,

Digitalization, globalization and demographic change are trends of the 21st century, distinctly changing the world of labor. Across sectors, both companies and employees are facing numerous challenges - but they also benefit from numerous opportunities which, with a powerful desire for change, will lead to success in the long term.

Dynamic developments allow innovations to be rethought, exploiting the competitive factor knowledge: By solidifying knowledge and deepening competencies, employees can increase their chances of employment, higher pay and greater satisfaction on the job. Managers of enterprises can create attractive working conditions through future-oriented company knowledge extension. They increase productivity and skilfully react to change processes in the face of new customer needs and market conditions.

At RWTH International Academy, we have been offering groundbreaking learning formats tailored to the needs of the market and oriented to target groups for years: Participants benefit from courses in the areas of Production Technology, management, engineering and quality management. We see ourselves as your competent partner in integrating academic and professional innovation and thus giving you a clear practical advantage.

Take a look at the extensive program of certificate courses for 2019. Our experienced lecturers cannot wait to create qualifications for the future with you.

We are looking forward to seeing you.

Yours

Dr. Helmut Dinger
Managing Director
RWTH International Academy

Did we catch your interest?
Here, you can learn more:
www.academy.rwth-aachen.de/certificate-courses
Production Technology

Data Science in Production

Industrial Big Data in Practice

Digitization for Industry 4.0

Mobile Robotic Systems in Intralogistics

Fit For Industry 4.0

Robot Operating System (ROS)

Smart Engineering for Smart Factories

Automation

Smart Automation Expert

Digital Solutions in Production

Visualization through Augmented/Virtual Reality

From Sensor to App

Chief Technology Manager

5G Communication and the Internet of Things

Portfolio
The offers of continued education at RWTH International Academy go beyond merely conveying theory. At least as much importance is placed on the participants being able to immediately apply what they have learned and thus creatively solve problems in their company. Only that ensures that a knowledge transfer indeed took place and that employees can create new impulses thanks to their personal qualification.

We are making modern findings from science and research usable for your professional work. To that end, we are using several sources: We are working closely with a network of companies, associations and other research institutes. On the RWTH Aachen campus alone, the largest science park in Europe, more than 280 companies are engaged in making use of synergy effects and jointly creating innovations for the future. Our participants learn how theory works in practice - and they do so in the laboratories, test stands and testing bays of the network partners.

In case studies, participants bring in personal questions from their companies. Our lecturers guide them as experts with expertise in the field, sharing their extensive experience from projects with various industry partners. They help projects to live up to reality and to the companies' challenges. Individual consultation in small groups also allows special challenges to be tackled quickly and as needed. Learning and application are thus handled in parallel.
The fourth industrial revolution, as a new layer of organization, allows control across the entire product life cycle and is always oriented towards specific customer demands. In order to successfully implement Industry 4.0, all relevant information have to be available in real time by incorporating all instances involved in the value chain.

Take a look at the wide range of courses offered on the following pages in the area of Production Technology. In application-oriented short modules, you will elaborate company-specific approaches to solutions based on case studies, allowing you to profitably integrate these solutions into your daily work. In addition, you will receive a certificate of completion from RWTH Aachen.
### Course Plan (subject to change)

<table>
<thead>
<tr>
<th>Day</th>
<th>Morning</th>
<th>Afternoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>From observations and models to data&lt;br&gt;Real-world data in CPS and robotic environments</td>
<td>Specific task pre-processing&lt;br&gt;(e.g. dimensionality reduction)&lt;br&gt;Coping with real-world data in CPS and robotic environments</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Introduction to heuristics&lt;br&gt;Introduction to rule-based programming and the Rete algorithm&lt;br&gt;BRMS and forward/backward chaining</td>
<td>Introduction to expert systems and decision support systems&lt;br&gt;Heuristic and rule based systems in Robotics</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Introduction to machine learning – supervised, unsupervised and reinforcement learning&lt;br&gt;Diving-deep: About neural networks and deep learning</td>
<td>How to build applications around DSS and recommendation systems&lt;br&gt;Bringing it together: Real-world industrial applications and challenges to solve</td>
</tr>
<tr>
<td>Thursday</td>
<td>Introduction to use case scenario&lt;br&gt;Building a first solution for the use case</td>
<td>Advancing the solutions towards the extended use case&lt;br&gt;Presentation and discussion of final solutions&lt;br&gt;Solving the use case example – discussing another solution and the corresponding technologies</td>
</tr>
<tr>
<td>Friday</td>
<td>Building a solution for the use case</td>
<td>Exam&lt;br&gt;Awarding of Certificates</td>
</tr>
</tbody>
</table>

- Networking tip: social event
Participants discover what Data Science is all about. They learn basic methods of preprocessing data and can evaluate them using artificial intelligence approaches. They develop a basic understanding of the application of machine learning and can successfully master practical applications in production.

In focus
- Preprocessing and provision of data for analysis
- Data Mining & Knowledge Discovery in Databases
- Artificial Intelligence and Deep Learning
- Machine learning with data from industrial practice
- Case study: Optimizing Industrial Applications with Machine Learning

As part of industrial manufacturing, continuously improving ongoing processes is becoming ever more important, e.g. to predictively maintain machines or sustainably improve production processes.

You are an engineer in the areas of production, research & development, optimization or planning with a fundamental understanding of data structures and object-oriented programming.
Course Plan (subject to change)

### Morning
- **Monday**
  - Introduction to Data Integration, Analysis and Mining
  - Data Analytics in Production
  - Machine Learning
  - Big Data Definition

- **Tuesday**
  - Data Source Systems
  - Practical session: RDBMS, OPC-UA, DDS, MQTT ...
  - Data change capture RDBMS

- **Wednesday**
  - Practical Session
    - Hive table structure on top of heterogenous data
    - CPS data integration

- **Thursday**
  - From Data Analytics to Big Data
    - Machine learning on Big Data
    - Big Data preprocessing
    - Hands-on session preprocessing

- **Friday**
  - Introduction to various visual analytic tools
  - Practical session: web based visual analytics, html, css, d3.js, javascript etc.

### Afternoon
- **Monday**
  - Industrial Big Data Scenarios
  - Data Ware House
  - Hadoop (DFS/YARN difference)
  - Holistic Use Case: Big Data/Data Analytics VisAn in a production scenario

- **Tuesday**
  - Extracting databases
  - Processing of Data before integration
  - World of available Apache Technologies

- **Wednesday**
  - Working with data in hadoop
  - Cases from industry
  - Data driven machine learning

- **Thursday**
  - From Data Analytics to Visual Analytics
    - Target-adaptive visualization
    - Specific problem visual analytics (histogram)

- **Friday**
  - Transfer of learned issues to specific scenarios of participants
  - Exam and Awarding of Certificates

### Networking tip: social event
Participants will discover the difference between "Big Data" and "Industrial Big Data" in the context of production. They will gain insight into the integration tools and structures required for highly distributed data analysis. In addition, they are introduced to the basic structures of big data ecosystems and big data in the cloud.

**In focus**
- Data integration, analysis, and data mining: Big Data and machine learning
- Big Data ecosystems: from isolated solution to Industrial Data Lake
- Integration of heterogeneous source systems of industrial data
- Data-driven procedures and machine learning

Data is the oil of the 21st century, and data analysis is the engine! Despite the multi-faceted collection of production data, the targeted usage of this data is often lacking since data integration and comparative observation are often fraught with difficulties. With the right analysis, however, data reveal hidden patterns and connections assisting in process optimization and continuous improvement.

You are an engineer in the areas of mechanical engineering and/or electrical engineering with a fundamental understanding of data concepts.

**Quick Facts**

**Certificate Course**
- Dates available upon request
- 5 days of attendance
- Prices available upon request
- German and English

**Sign up now!**
www.academy.rwth-aachen.de/industrial-big-data-in-practice

**Any more questions?**

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Course Plan (subject to change)

**Monday**
- Industry 4.0
- Real time control processes and real time communication

**Tuesday**
- Rabbit MQ
- MQTT
- Zero MQ

**Wednesday**
- Introduction to ROS & Linux

**Thursday**
- Ontology based modeling

**Friday**
- OPC UA

**Afternoon**
- Layer model: from physical layer to application using the example of Ethernet and TCP/IP
- Modern ethernet based automation busses
- DDS
- RTI’s DDS free demo for windows
- ROS: communication with robots
- OPC classic
- OPC UA
- Exam
- Awarding of Certificates

Networking tip: social event
Digitization for Industry 4.0
Transforming Machine-to-Machine Communication Into a Networked Factory

Participants develop an understanding of the challenges of heterogeneous production environments and learn about basic technologies for digital networking. In addition, they acquire the basics of information modeling and can apply them in production by means of interface technologies.

In focus
- Communication for the Internet of Things
- Interface standards for machine-to-machine communication
- Publish-Subscribe solutions with the networking standards DDS and MQTT
- Information Modeling and Information Management in Production Networks
- Case study: Data Integration and Real-Time Optimization

Networked production creates interoperability between formerly proprietary, separated systems. With continuous communication between the elements of a production network, intelligent, self-learning and self-regulating systems are generated which autonomously optimize themselves based on current sensor technology. Efficient processing and analysis of data allows companies to respond to changed framework conditions in nearly real time and to adaptively adjust their production processes.

You are an engineer from the area of mechanical engineering and/or electric engineering with fundamental knowledge of communication in computer networks.

Quick Facts

Certificate Course
- Dates available upon request
- 5 days of attendance
- Prices available upon request
- German and English

Sign up now!
www.academy.rwth-aachen.de/communication-in-industry-4-0

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Course Plan (subject to change)

**Morning**

**Monday**
- Introduction
  - Review of communication, ROS and Linux
  - Introduction to mobile Robotics
    - Hardware + Software-Concepts

**Tuesday**
- Semantics and Syntax of task-level planning concepts
- Practical session – Writing the first agent logic

**Wednesday**
- Hierarchical motion planning concept
- Practical sessions: Starting the path planner in simulation, Defining global search graph, Connecting nodes and edges on 2D

**Thursday**
- Local path planning and collision avoidance
- Visualization of costmaps
- Configuration of local path planning and collision avoidance

**Friday**
- Concept of state-machines
- Applying behaviors as skills
- Monitoring path execution

**Afternoon**

- Vision and Laser Sensor
- Acquisition of Vision and Laser Sensor Visualization
- Mobile Robotics Drive
- Moving the robots

- Introduction to logistics task
- Mapping the log. task to rules and facts
- Implementing rules and facts for the agent
- Implementing task-level planner on the real robots

- Apply planning algorithm on search-graph
- Application in logistics: tasks of global path planning
- Bringing up the global path planner on the real robots

- Applying local path planning on the real robot
- Introduction to test phase

- Solving intralogistics task with skills
- Separation and connection into serialized behavior calls from task-level planner
- Exam & Awarding of Certificates

**Scientific lead:** Dr. Max Hoffmann

**Course Characteristics**

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<th>Practical application</th>
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**Practical exercises with real mobile robots**

**Math/statistics**

- Little
- A lot

**Programming**

- Little
- A lot

**Production optimization**

- Little
- A lot

**Management**

- Little
- A lot

**Competency in methodology**

- Little
- A lot

**Practical application**

- Little
- A lot

**Network tip:** social event
Learn how to control mobile robotics systems in the intralogistic environment. You will work directly with the software architecture allowing robots to freely navigate in a room and to autonomously execute material flow tasks. You will also get to know the open source project Robot Operating System (ROS).

In focus
- Hardware and software concepts of mobile robotics including planning of movement
- Application of local and global path planning and collision avoidance
- Application in flexible material flow systems with the Robot Operating System (ROS)
- Environmental perception of mobile robotics systems with various sensor technologies

The increasing variety and short-lived nature of products are two key drivers of using flexible material flow systems in the production area. Aside from fixed transport systems, the past ten years have seen ever more automated guided vehicles (AGV) come into use. Further development towards autonomous mobile robotics systems thus allows free and autonomous decision-making.

You are an engineer or computer scientist in the areas of mechanical engineering, electrical engineering, and computer science with programming knowledge in C++ and Python.

Quick Facts
- Certificate Course
  - Dates available upon request
  - 5 days of attendance
  - Prices available upon request
  - German and English

Sign up now!
www.academy.rwth-aachen.de/mobile-robotic-systems-in-intralogistics

Any more questions?
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Course Plan (subject to change)

Morning

Wednesday
- Industry 4.0 and digital transformation
- CPS and digital twins
- Interoperability in production

Thursday
- The Internet of Things for production
- Light-weight networking strategies for the Internet of Production

Afternoon
- Communication for the factory of the future
- Generic interfaces and interoperability
- Models for digital networks in companies
- Scalable information integration based on generic tool chains

Scientific lead: Dr. Max Hoffmann

Course Characteristics

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Participants are introduced to the technologies associated with terms such as Industry 4.0, Digital Shadow or Reference Architecture RAMI4.0. They will be able to navigate safely through the conceptual worlds of digital transformation. They are aware of the central challenges associated with establishing cyber-physical systems and a digital twin in production.

In focus
- Communication in modern production facilities
- Reference architectures and standards in Industry 4.0
- Data-driven process optimization based on interoperability & machine learning
- Overview of Industry 4.0 technologies and their practical applications
- From data to decisions for manufacturing companies

The buzzword Industry 4.0 describes a collection of technologies leading to the factory of the future. To understand, categorize, and successfully apply the theoretical foundation, i.e. the technological basics for the digital transformation, an entirely new understanding is necessary.

You are an engineer in the area of mechanical engineering and electrical engineering and have fundamental knowledge of production technology.

Quick Facts

Seminar – Certificate of Attendance
- Dates available upon request
- 2 days of attendance each
- Prices available upon request
- German

Sign up now!
www.academy.rwth-aachen.de/industrial-engineering

Any more questions?
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<tr>
<td>▶ Why ROS?</td>
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<td>▶ Demonstration of ROS based systems</td>
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<td>▶ Linux + ROS Filesystem</td>
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<td>Tuesday</td>
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<tr>
<td>▶ ROS basics: action services</td>
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<td>▶ Practical session ROS</td>
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<tr>
<td>Wednesday</td>
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<td>▶ Gazebo basics: models, worlds</td>
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<td>▶ Practical session Gazebo</td>
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<td>Thursday</td>
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<td>▶ ROS theory: sensor drivers</td>
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<td>▶ Practical session</td>
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<td>Friday</td>
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<td>▶ ROS theory: localisation and mapping</td>
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**Scientific lead: Dr. Max Hoffmann**

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**Control and programming of real robots**
**Quick Facts**

- Dates available upon request
- 5 days of attendance
- Prices available upon request
- English

**Certificate Course**

- Localization, mapping and motion planning with ROS
- Integrating ROS into industrial application fields
- Testing the advantages of ROS and ROS-based systems as examples
- Application of local and global path planning and collision avoidance
- Application in flexible material flow systems with the Robot Operating System (ROS)
- Environmental perception of mobile robot systems with various sensor technologies

**Sign up now!**

www.academy.rwth-aachen.de/ros-for-industrial-robots

**Any more questions?**

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Participants acquire the basics of robot motion sequences and the Robot Operating System (ROS) operating system. Based on fundamental communication concepts with robots, they will understand how these can be autonomously localized and navigated in a logistics scenario.

**In focus**

- Localization, mapping and motion planning with ROS
- Integrating ROS into industrial application fields
- Testing the advantages of ROS and ROS-based systems as examples
- Application of local and global path planning and collision avoidance
- Application in flexible material flow systems with the Robot Operating System (ROS)
- Environmental perception of mobile robot systems with various sensor technologies

The Robot Operating System (ROS) has achieved an impressive influence in research and product development. It contains many open source implementations of common robotics functions and algorithms in areas such as perception, knowledge representation as well as planning and control. With mobile and stationary robotics systems as well as underwater robots or flying drones, there are few limits to the applicability of the software.

You are an engineer or computer scientist in the areas of mechanical engineering, electrical engineering, and computer science.
Course Plan (subject to change)

**Monday**
- Introduction to Industry 4.0
- Enabling Technologies for Industry 4.0

**Tuesday**
- PLM-based Robot Assembly
- New Control Paradigms for Future Production Systems

**Wednesday**
- Challenge of Consistent Information Flows: From Engineering to Production
- Software Architectures and Development Processes
- Data Modelling and Database Systems

**Thursday**
- Introduction to Communication Networks in Modern Production Systems
- Machine-2-Machine Communication

**Friday**
- Enterprise Resource Planning (ERP) and Manufacturing Execution System (MES)

- Networking tip: social event

Participants praise the practical relevance of the course contents for professional work.

**Course Characteristics**

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</table>
In parallel to classical topics of Product Lifecycle Management (PLM), participants become acquainted with the potentials of “Front Loading”. They learn the basics of digitized production and focus on the integration of modern information technologies into technical processes. They will be able to successfully implement (engineering) technical approaches and concepts independently.

In focus
- Machine-2-Machine-Communication / Human-Machine-Interfaces
- Key Performance Indicators (KPI) and Dashboards for Information Visualization
- Enterprise Resource Planning (ERP) and Manufacturing Execution System (MES) for industrial robotics
- Workshop: Integrated, collaborative robots and PLM-based Robot Assembly
- Case Study: Optimization of an industry 4.0 production site

The Smart Factory networks and automates machines and plants to autonomously adapt production steps to each other. Product families with numerous variants and shorter and shorter product life cycles require efforts to be shifted to engineering development (“front loading”). With a continuously available planning chain, new product variants can be produced efficiently.

You are an engineer from the areas of mechanical engineering and/or electrical engineering.

Quick Facts
- Certificate Course
  - Dates available upon request
  - 5 days of attendance
  - Prices available upon request
  - English

Sign up now!
www.academy.rwth-aachen.de/smart-engineering-for-smart-factories

Any more questions?
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Course Plan (subject to change)

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<th>Morning</th>
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<tbody>
<tr>
<td><strong>Wednesday</strong></td>
<td><strong>Integrated Engineering</strong></td>
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<tr>
<td>Introduction into industrial automation</td>
<td>Product Lifecycle Management (PLM)</td>
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<tr>
<td>Areas of application</td>
<td>Simulation of mechatronic systems</td>
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<td>Heterogeneous control architectures</td>
<td>Practical application</td>
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<tr>
<td>Industry 4.0</td>
<td><strong>Industrial and collaborative robotics</strong></td>
</tr>
<tr>
<td><strong>Enabling Technologies for Industry 4.0</strong></td>
<td><strong>Basics and overview of technologies</strong></td>
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<tr>
<td>Methodology and operating principles</td>
<td>Application examples</td>
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<td>Practical application</td>
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<tr>
<td><strong>Thursday</strong></td>
<td><strong>Lab visit: Smart Automation Lab</strong></td>
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<td>PLM-based robotics applications</td>
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<tr>
<td>New control paradigms for future production plants</td>
<td>Innovative technologies for the human-machine interaction on the shop floor</td>
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<td>Practical exercise</td>
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Scientific lead: Prof. Christian Brecher

Fundamental seminar with numerous practical examples

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</table>
Experience current and future trends of automated production and learn the basics of all levels of automation technology. You will be introduced to applied technologies, their functionality, requirements, and the framework conditions for planning and implementing automated systems.

In focus
- Basics of model-based applications in automation
- Application examples and theoretical foundation of industrial robotics
- Practice example: application of new control paradigms
- Lab visit: Smart Automation Lab

Automated production today represents an important economic sector in German machine and plant engineering. Product-centered control, CPS, networking of virtual and real world, individualized production and human-robot cooperation unlock numerous potentials: from increased efficiency to the foundation for new business models.

You are an executive or decision maker in the areas of manufacturing and production.

Quick Facts
Seminar – Certificate of Attendance
- Dates available upon request
- 2 days of attendance
- Prices available upon request
- German or English

Sign up now!
www.academy.rwth-aachen.de/automation

Any more questions?
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Tel. +49 241 8097865
Course Plan (subject to change)

Morning

Monday
- History of Industry 4.0 and current developments in production technology
- Integrated production technology
- Networking of production plants

Tuesday
- Challenges of a continuous (data) automation pyramid, potentials and challenges of cloud computing
- Human-machine interaction
- Human-robot collaboration

Wednesday
- Internet of Production for robot-based plants
- Assembly Robotics and Smart Automation

Thursday
- Working on application exercise II

Friday
- Working on application exercise IV

Afternoon

Monday
- Flexibilization of production plants
- Enabling technologies of Industry 4.0 (OPC UA, radio...)

Tuesday
- Lab visit: Smart Automation Lab
- Case study

Wednesday
- Introduction to the practical application exercise
- Working on application exercise I

Thursday
- Working on application exercise III

Friday
- Exam: Presentation of results
- Expert panel
- Handing out of certificates

Networking tip: evening event
You will understand the ideas and concepts of a networked factory based on practical examples and your own implementation of a robot-based application. You will receive a fundamental understanding of current topics, changes, and trends in production automation.

In focus
- Intelligent control and provision of information in automation
- Areas of application and theoretic foundations of industrial robotics
- Practical example: application of new control paradigms
- Visit of the Smart Automation Lab

Automated production today represents an important economic sector in German machine and plant engineering. Product-centered control, CPS, networking of virtual and real world, individualized production, and human-robot cooperation unlock numerous potentials: from increased efficiency to the foundation for new business models.

You are an expert or executive in the areas of manufacturing, production, or mechanical engineering.

Quick Facts
Certificate Course
- Dates available upon request
- 5 days of attendance
- Prices available upon request
- German or English

Sign up now!
www.academy.rwth-aachen.de/automation-expert

Any more questions?
Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
Course Plan (subject to change)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td></td>
</tr>
<tr>
<td>Basics Industry 4.0</td>
<td>Elaboration of approaches for solutions</td>
</tr>
<tr>
<td>Digital waste walk</td>
<td>Economic benefits</td>
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<tr>
<td>(lab tour lean production)</td>
<td>Digital applications in production</td>
</tr>
<tr>
<td>Tuesday</td>
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<tr>
<td>Data-based value stream mapping</td>
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<tr>
<td>Data processing and programmable</td>
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</tr>
<tr>
<td>logic control</td>
<td>Digital business models in practice</td>
</tr>
</tbody>
</table>

Course Characteristics

- Math/statistics: little
- Programming: little
- Production optimization: little
- Management: little
- Competency in methodology: little
- Practical application: a lot

Digital Capability Center
Aachen

Scientific lead: Prof. Thomas Gries
Reveal waste and inefficient processes in various areas of production and get to know the meaning of Industry 4.0. You will learn how to identify procedural weaknesses and how to generate digital applications and proposed solutions along the value chain.

In focus
- Application and elaboration of digital solutions
- Uncovering waste in production and generating Industry 4.0-based solutions
- Practical visualization via individual application
- Interactive exchange and lab tour in small groups

Industry 4.0 is considered a tremendous opportunity to increase competitiveness. Optimizing and automating processes, networking systems as well as implementing new technologies pose fresh challenges to companies. The digital transformation allows productivity increases, reductions of waiting and maintenance costs as well as shortening the time to market.

You are an engineer, technician, manager and/or executive in the areas of mechanical engineering, manufacturing, electrical engineering, IT, digitalization, HR, operative, and strategic management.

Quick Facts
Seminar – Certificate of Attendance
- Dates available upon request
- 2 days of attendance
- Prices available upon request
- German or English

Sign up now!

Any more questions?
Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
Course Plan (subject to change)

**Morning**

- **Wednesday**
  - Introduction to and advantages of AR/VR
  - Theoretical and practical requirements
  - Demonstrations of AR/VR solutions in the model factory

- **Thursday**
  - Creation of animations
  - Introduction of software technologies

**Afternoon**

- Programming a Daydream application
- Programming and creation of an AR application for maintenance work in production

Scientific lead: Prof. Thomas Gries
Experience the difference between Augmented and Virtual Reality applications and learn more about the various areas of application. Whether in marketing, for teaching platforms or maintenance work in production: Independently setting up Daydream applications and programming Augmented Reality applications with the aid of CAD models will allow you to learn how to autonomously handle these technologies.

In focus
- Augmented and Virtual Reality in the production context
- Implementing Daydream applications
- Lab tour in a model factory 4.0
- Programming AR and VR applications

Augmented and Virtual Reality applications are key for the ongoing digitalization in the company to map production processes and products close to reality and to use these for a targeted marketing. Employing these technologies in production can lead to increased efficiency and productivity. They serve to reduce machine downtime, thus rendering remote maintenance systems and the use of technicians obsolete.

You are an engineer, technician, manager or executive in the areas of marketing, mechanical engineering, manufacturing, communication.

Quick Facts

Seminar – Certificate of Attendance
- Dates available upon request
- 2 days of attendance
- Prices available upon request
- German or English

Sign up now!
www.academy.rwth-aachen.de/visualization-through-ar

Any more questions?
Your Team
Certificate Courses & Inhouse Programs
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Tel. +49 241 8097865
Course Plan (subject to change)

Morning
- Introduction sensor technology, measurement technology, data processing
- Introduction programmable logic controller
- Practical visit of the machine park, introduction to soft- and hardware

Tuesday
- Presentation of group tasks: app development
- Group work

Afternoon
- Operating exemplary sensor technology and data extraction with a measuring system
- Group work
- Presentation of group results
- Summary of learning results

Course Characteristics

<table>
<thead>
<tr>
<th>Subject</th>
<th>little</th>
<th>a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math/statistics</td>
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<tr>
<td>Programming</td>
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<td>Production optimization</td>
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<td>Management</td>
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<td>Competency in methodology</td>
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<td>Practical application</td>
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</table>

Scientific lead: Prof. Thomas Gries
Learn the basics of sensor technology, control technology, data processing and visualization and put it to use in real machines. You will be able to conduct independent automation projects, identify relevant partners and put together development teams. You will develop your own app to visualize real time machine data.

In focus
- Individual visualizations for your own company
- Various possibilities of further processing of data
- Practical work on sensors and machines in a model factory
- Extracting and evaluating data

In the field of Industry 4.0, data play a key role. Merely collecting large amounts of data on the road to digital transformation is hardly efficient since a suitable cross-company strategy for the further processing of the data is rarely in place. Generating economic usefulness from typical Industry 4.0 technologies therefore is only possible as part of a suitable, company-specific strategy of data processing.

You are an engineer, technician, electrician, IT employee in the areas of mechanical engineering, electrical engineering, production/manufacturing.

Quick Facts
Seminar – Certificate of Attendance
- Dates available upon request
- 2 days of attendance
- Prices available upon request
- German or English

Sign up now!
www.academy.rwth-aachen.de/from-sensor-to-app

Any more questions?
Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
Course Plan (subject to change)

**Morning**

- **Monday**
  - Introduction
  - Key to success: technology and innovation management

- **Tuesday**
  - Systematic acquisition and analysis of your own skills and competencies

- **Wednesday**
  - Market and technology analysis and orientation of technological future II
  - Development of new business models

- **Thursday**
  - Technology scouting and monitoring
  - Integrated technology planning I

- **Friday**
  - The Aachen vision of technology and innovation management
  - Exam
  - Feedback session

**Afternoon**

- Interaction of technology and innovation management
- Understanding your own business model
- Technology- and competence-based diversification
- Market and technology analysis and orientation of technological future I
- From competence and environment analysis to a technology strategy
- Development of a technology strategy
- Integrated technology planning II
- Agile technology development
- Awarding of certificates

**Networking tip:** evening event

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Participants praise the topical structure of the course, the new approaches and the efficient extension of the network.
Implement successful approaches to technology and innovation management, develop a consistent strategy, identify new technologies, develop these goal-specifically and implement innovative business models for your individual market success.

In focus
- Field-tested methods for the systematic design of a strategic technology and innovation management
- Interfaces to business model innovations and agile technology development
- Solidification of learned contents in practical exercises based on a continuous case study
- Procedures, methods and tools from industrial practice

Creating and maintaining a successful competitive position requires choosing the right technologies. Ever shorter technology and product life cycles, increasing global competition and growing individualization of products demands that companies have the key skill of knowing or anticipating the needs of their customers. A well-conceived technology management accordingly is no longer a luxury but a must have!

You are an expert or executive in a technology-oriented company with at least 5 years of professional experience in the areas research or development, technology and innovation management, new business development and strategy, production or technical purchasing.

Quick Facts

Certificate Course
- Dates available upon request (Aachen)
- Dates available upon request (Munich)
- 5 days of attendance each
- Prices available upon request
- German

Sign up now!
Course in Aachen: www.academy.rwth-aachen.de/ctm
Course in Munich: https://www.academy.rwth-aachen.de/ctm-munich

Any more questions?
Your Team
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 further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
Course Plan (subject to change)

**Morning**
- **Monday**
  - Mobile telecommunications systems and LTE
- **Tuesday**
  - Communications technology
- **Wednesday**
  - Basics for the Internet of Things, Part 1
- **Thursday**
  - Optimization and machine learning in 5G, Part 1
- **Friday**
  - Exam
  - Innovation workshop, Part 1

**Afternoon**
- **Monday**
  - System design and sensor signal processing
- **Tuesday**
  - HF system and transmission technology
- **Wednesday**
  - Basics for the Internet of Things, Part 2
- **Thursday**
  - Optimization and machine learning in 5G, Part 2
- **Friday**
  - Innovation workshop, Part 2
  - Awarding of certificates

Networking tip: evening event

---

Scientific lead: Prof. Anke Schmeink
Learn the principles and technologies of future wireless 5G communications systems in the areas of system design, communications technology, optimization of LTE systems, HF systems and IoT platforms. Get to know methods and tools to create the foundation for new products and to successfully keep them on the market.

In focus
- Holistic concept: from system design to the basics of signal processing to the platform
- Optimization and machine learning in 5G LTE
- Practical planning game as part of an innovation workshop
- Graphical development environment for IoT platforms

5G has the potential of revolutionizing key industries such as health care, transport, infrastructure, media and production. This brings with it important tasks and great challenges: extremely low latency periods of 1 millisecond, 100 times higher data rates than today’s networks, 100 billion end devices across the world as well as low power usage. The Internet of Things and intelligent networks are key elements of 5G. The methods and approaches of this technology open many new business models for SMEs.

You are an engineer and/or executive with a technical degree in the areas of electrical engineering, manufacturing, mechanical engineering.

Quick Facts
Certificate Course
- Dates available upon request
- 5 days of attendance
- Prices available upon request
- German

Sign up now!
www.academy.rwth-aachen.de/5g-communication

Any more questions?
Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
In order to achieve Six Sigma in the classic sense, quality management has to ensure that of 10 million products or processes, at most 34 are faulty. No company can reach these values without appropriate measures!

The average quality level is at three to four Sigma – and yet, there are areas where this is key:

**In production and service:**
- Excellent performance with high efficiency and stable processes with extremely low failure rates and high customer orientation and

**In operative support:**
- Improving process performance in the areas of human resources, finances, purchasing and sales.

---

**Six Sigma in practice**

**99 % good (3,8 Sigma)**

- 20,000 lost letters per hour
- ca. 15 minutes per day of unsafe drinking water
- 5,000 failed surgeries per week
- 200,000 wrong drug prescriptions per year
- nearly 7 hours of power failures per month

**99.99966 % good (6 Sigma)**

- 7 lost letters per hour
- 1 minute of unsafe drinking water every 7 months
- 1.7 botched surgeries per week
- 68 wrong drug prescriptions per year
- nearly 1 hour of power failures every 34 years
Course Plan (subject to change)

Morning

Monday/Thursday
- Introduction Six Sigma
- Introduction DMAIC cycle
- Introduction Define phase

Tuesday/Friday
- Measuring system analysis
- Process stability & capability
- Introduction Analyze phase
- Techniques for problem structuring

Afternoon

- Basics of statistics
- Process visualization
- Introduction Measure phase
- Introduction and basic tools of Improve phase
- Correlation and regression
- Hedging strategies
- Introduction and basic tools of Control phase
Six Sigma Yellow Belt
Achieving Statistics Quality Goals

**Based on** the Six Sigma philosophy, you will work on early improvement projects, solidify basic statistics knowledge and learn how to apply problem-solving methods with a case study.

**In focus**
- Tools and methods to implement the DMAIC cycle
- Process visualization
- Practical planning games and case studies
- Group work & interactive learning space

**The widespread quality management concept Six Sigma** offers a framework for action for the systematic planning and effective execution of sustainable improvement projects using structured project management approaches. It assists organizations in pursuing both a disciplined and data-driven approach as well as a method for error reduction. The Six Sigma Yellow Belt is the first step in the Six Sigma training: Here, you’ll become an expert for process optimization and waste reduction based on statistical and analytical methods.

**You are** a project leader, quality manager, expert or executive in the service or production industry with at least one year of professional experience.

**Quick Facts**

**Seminar – Certificate of Attendance**
- Dates available upon request
- 2 days of attendance each
- Prices available upon request
- German

**Sign up now!**

www.academy.rwth-aachen.de/ssyb

**Any more questions?**

Your Team
Certificate Courses & Inhouse Programs
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Tel. +49 241 8097865
### Course Plan Module I (abbreviated)

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<thead>
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<th>Morning</th>
<th>Afternoon</th>
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<tbody>
<tr>
<td><strong>Tuesday</strong></td>
<td><strong>Wednesday</strong></td>
</tr>
<tr>
<td>Introduction Six Sigma Basics</td>
<td>Project charter and conclusion Define phase</td>
</tr>
<tr>
<td>DMAIC cycle</td>
<td>Basics of statistics, introduction Minitab</td>
</tr>
<tr>
<td><strong>Wednesday</strong></td>
<td><strong>Thursday</strong></td>
</tr>
<tr>
<td>Data collection and data quality</td>
<td>Process recording</td>
</tr>
<tr>
<td>Measuring system analysis</td>
<td>Process capability</td>
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<tr>
<td>Process stability</td>
<td>Conclusion Measure phase</td>
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<tr>
<td><strong>Thursday</strong></td>
<td><strong>Friday</strong></td>
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<tr>
<td>Introduction Analyze phase</td>
<td>Process structure matrix</td>
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<tr>
<td>Techniques for structuring problems</td>
<td>System, function and fault tree analysis</td>
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<td>Analysis plan</td>
<td>Pareto analysis</td>
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### Course Plan Module II (abbreviated)

<table>
<thead>
<tr>
<th>Tuesday</th>
<th>Wednesday</th>
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<tbody>
<tr>
<td>Project presentations</td>
<td>Multi-variant analysis</td>
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<tr>
<td>Statistical process control (SPC)</td>
<td>Correlation and regression analysis</td>
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<td>Confidence intervals &amp; tests of hypotheses</td>
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<tr>
<td><strong>Wednesday</strong></td>
<td><strong>Thursday</strong></td>
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<tr>
<td></td>
<td>Conclusion Analyze phase</td>
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<td></td>
<td>Introduction Improve phase</td>
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<td>Creativity techniques</td>
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<tr>
<td>CUSUM</td>
<td>Selection of improvement alternatives</td>
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<tr>
<td>Types of problems</td>
<td>Procedures, FMEA and Poka Yoke</td>
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<td>Conclusion Improve phase</td>
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<td><strong>Thursday</strong></td>
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<td></td>
<td>Introduction Control phase</td>
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<td></td>
<td>OCAP and reaction plans</td>
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<td>Basics production control plan</td>
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<td>Exam and subsequent guided tour through the institute</td>
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<td>Awarding of certificates</td>
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</table>
**Six Sigma Green Belt**

Achieving Sustainable Improvements in Companies

**Improve** company processes and identify hidden potentials. With the DMAIC cycle from Six Sigma, you can filter key improvement activities, measure and implement them and possibly transfer these to other business areas.

**In focus**
- Methods for structuring problems, tests of hypotheses and creativity techniques
- Statistical tools for process and problem analysis
- Management and elaboration of quality improvement projects with Minitab
- Practical application: innovative case studies and company-specific project

**Six Sigma offers** a framework for action in the systematic planning and effective execution of sustainable improvement projects based on the DMAIC cycle. With the embedded methods, root causes for difficult problems in processes can be identified, allowing sustainable solutions to be developed based on statistical analyses. Measurable results have been primarily achieved in the areas of process costs and waste reduction as well as in the reduction of throughput times.

**You are** a project leader, quality manager, expert or executive in the service or production industry with at least one year of professional experience.

---

**Quick Facts**

**Certificate Course**
- Dates available upon request
- 2 x 4 days of attendance each
- Prices available upon request
- German

**Sign up now!**

www.academy.rwth-aachen.de/six-sigma-green-belt

**Any more questions?**

Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
Course Plan Module I (subject to change)

<table>
<thead>
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<th>Afternoon</th>
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<tbody>
<tr>
<td>Monday</td>
<td></td>
</tr>
<tr>
<td>‣ Greeting and round of introductions</td>
<td>‣ Sprint review Define</td>
</tr>
<tr>
<td>‣ Goal and set-up of the obligatory phase</td>
<td>‣ Introduction Minitab</td>
</tr>
<tr>
<td>‣ Introduction to the case studies</td>
<td>‣ Sprint planning Measure</td>
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<tr>
<td>‣ Sprint planning Define</td>
<td>‣ Measure sprint</td>
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<tr>
<td></td>
<td>‣ Sprint review Measure</td>
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<td></td>
<td>‣ Conclusion and feedback day 1</td>
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<table>
<thead>
<tr>
<th>Tuesday</th>
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<tbody>
<tr>
<td>‣ Sprint planning Analyze</td>
<td>‣ Analyze sprint (I/II)</td>
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<tr>
<td>‣ Analyze sprint (I/II)</td>
<td>‣ Sprint review Analyze</td>
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<td></td>
<td>‣ Conclusion and feedback day 2</td>
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Course Plan Module II (subject to change)

<table>
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<tbody>
<tr>
<td>‣ Goal and set-up of the obligatory phase</td>
<td>‣ Sprint planning Improve</td>
</tr>
<tr>
<td>‣ Presentation of company-specific project examples</td>
<td>‣ Improve sprint</td>
</tr>
<tr>
<td></td>
<td>‣ Sprint review Improve</td>
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<td>‣ Conclusion and feedback day 1</td>
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<table>
<thead>
<tr>
<th>Friday</th>
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<tbody>
<tr>
<td>‣ Introduction Control</td>
<td>‣ Presentation of goals and experiment plan</td>
</tr>
<tr>
<td>‣ Sprint planning Control</td>
<td>‣ Sprint review Control</td>
</tr>
<tr>
<td>‣ Control sprint</td>
<td>‣ Conclusion and feedback day 2</td>
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</tbody>
</table>

Scientific lead: Prof. Robert Schmitt
Implement decisive improvement measures in innovative case studies, learn to improve company processes and identify hidden potentials with the Six Sigma methodology. You can learn the course contents flexibly and at your own speed, thus reducing your absent hours in your company.

In focus
- Methods for structuring problems, testing hypotheses and creativity techniques
- Process optimization based on the DMAIC cycle
- Easy to study online: quality management theories
- Practical application: innovative case studies and company-specific project

In the area of e-learning, teaching videos and webinars are ideal for time- and cost-efficient participation in training events while benefiting from high-quality knowledge. The practical application of what you have learned still remains an important component to solidifying the competences: In our training sessions with obligatory attendance, you can thus apply the learned theory practically in close contact with other participants and the lecturers.

You are a project leader, quality manager, expert or executive in the service or production industry with at least one year of professional experience.

Quick Facts
Certificate Course
- Dates available upon request
- 2 x 2 days of attendance + online preparation incl. webinars
- Prices available upon request
- German

Sign up now!
www.academy.rwth-aachen.de/ssgb-hybrid

Any more questions?
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further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
Scientific lead: Prof. Robert Schmitt

### Course Plan Module I (abbreviated)

<table>
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<th>Morning</th>
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<tbody>
<tr>
<td><strong>Tuesday</strong></td>
<td>Basic tools of the DMAIC cycle</td>
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<td>Presentation of the individual Green Belt projects</td>
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<tr>
<td><strong>Wednesday</strong></td>
<td>Project selection and workshop on the definition of “lighthouse” projects</td>
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<td>Basics &amp; methods of project management</td>
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<tr>
<td><strong>Thursday</strong></td>
<td>Six-Sigma teams: guidance, motivation, coaching &amp; conversation</td>
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<td><strong>Friday</strong></td>
<td>Statistics</td>
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### Course Plan Module II (abbreviated)

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<thead>
<tr>
<th>Tuesday</th>
<th>Thursday</th>
<th>Friday</th>
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</thead>
<tbody>
<tr>
<td>Presentation of individual projects</td>
<td>Experiments for non-linear systems</td>
<td>Reflection Control phase</td>
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<td></td>
<td>reflection Improve phase</td>
<td>Application control charts</td>
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<td>6-3-5 method and affinity diagram</td>
<td>Networking tip: evening event</td>
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<tr>
<td></td>
<td>application of morphological box and TRIZ</td>
<td>OCAPs, test planning, production control plan</td>
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<td></td>
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<td>knowledge management and standardization</td>
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<tr>
<td>Sigma level (in particular non-normal distribution)</td>
<td>Selection of solution alternatives (Pugh, NWA)</td>
<td>final project report</td>
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<td>FMEA for risk minimization</td>
<td>reflection Control phase</td>
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<td>tolerance analysis</td>
<td>Application control charts</td>
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<td>Sigma level</td>
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<td>(Multi-factor) variant analysis</td>
<td>(Multi-factor) variant analysis</td>
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<td>DoE: repetition &amp; working on example</td>
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<td>presentation of DoE group results</td>
<td>presentation of DoE group results</td>
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**Course Characteristics**

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<tr>
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<th>Competency in methodology</th>
<th>Practical application</th>
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Six Sigma Black Belt

The Expert Level

**Expand** your Six Sigma Green Belt knowledge to independently lead improvement projects and identify root causes of problems in processes. You will be able to take on project leadership in your Six Sigma team, coach colleagues as well as implement target-oriented reports for management.

**In focus**
- Extending Six Sigma Green Belt skills
- Leadership of larger, more complex improvement projects in your own company
- Project work phase: individual coaching by experienced course instructors
- Extensive participation documents including workbook with form sheets and templates

**Six Sigma Black Belt** conveys approaches to quality management as a holistic set of methods and as a philosophy, serving to achieve measurable results such as e.g. the reduction of process costs as well as the shortening of throughput times for companies. This course is based on Green Belt knowledge, extending the methods along the DMAIC phase model to lead project teams, expanding statistics knowledge and offering approaches on how to establish Six Sigma in the company.

**You are** a project leader, quality manager, expert or executive from the service or production sector and have a degree as a Six Sigma Green Belt as well as relevant professional experience.

**Quick Facts**

**Certificate Course**
- Dates available upon request
- 2 x 4 days of attendance
- Prices available upon request
- German

**Sign up now!**

www.academy.rwth-aachen.de/ssbb

**Any more questions?**

Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
RWTH Aachen university’s excellent reputation in research and teaching in the areas technology and engineering sciences is also evidenced by the current QS Ranking by Subject: RWTH Aachen has achieved the worldwide ranking 31 in the area “Engineering & Technology” as well as rank 2 in the German comparison. In the category “Natural Sciences,” it has achieved the worldwide rank 36 and thus third place among German universities.


The certificate courses and seminars in the area of engineering are developed in close collaboration with reputable chairs of RWTH Aachen, representing the excellent quality of the teaching contents.
### Course Plan (subject to change)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tuesday</strong></td>
<td><strong>Wednesday</strong></td>
</tr>
</tbody>
</table>
| - Greeting and introduction of the machine tool lab  
  - Metallurgical basics  
  - Basics of sheet metal forming | - Summary day 1  
  - Specialization contents tool construction  
  - Specialization contents plant technology | - Summary day 2  
  - Specialization contents FE simulation and modeling, tribology  
  - Specialization contents statistical analysis and measuring technology | - Summary days 1-3  
  - Exam |
| | | - Specialization contents precision cutting 4.0  
  - Exam preparation | - Awarding of certificates |
| | | | - Networking tip: evening event |

### Course Characteristics

<table>
<thead>
<tr>
<th>Area</th>
<th>little</th>
<th>a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math/statistics</td>
<td><img src="image" alt="Rating" /></td>
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</tr>
<tr>
<td>Process technology</td>
<td><img src="image" alt="Rating" /></td>
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<tr>
<td>Production optimization</td>
<td><img src="image" alt="Rating" /></td>
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</tr>
<tr>
<td>Competency in methodology</td>
<td><img src="image" alt="Rating" /></td>
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</tr>
<tr>
<td>Practical application</td>
<td><img src="image" alt="Rating" /></td>
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</tr>
</tbody>
</table>
**Master** trends of precision cutting such as e.g. the use of environmentally friendly lubricants or independent agile process changes. You will understand the interaction between process, tool, press, plant periphery as well as tribology and you will be able to identify process anomalies in time with statistical analysis (Six Sigma) or numerical methods (FEM).

**In focus**
- Process technology and metallurgic basics
- FE simulation and modeling, tribology
- Practical application with a Feintool XFT2500
- Industry 4.0-supported process control in the machine shop

**Fine blanking**, due to the high quality of the cutting edge and the according energy and resource efficiency, is of great importance for production technology. Economy and precision are the two primary characteristics of this technology. To further extend the advantage over alternative technologies, precision cutting enterprises have to service current trends: These include ultra-high strength sheet material as well as the digitalization of the value chain.

**You are** an expert or executive or a lateral entrant with at least one year of relevant professional experience in the areas of precision cutting technology, stamping or bending technology or tool construction.

**Quick Facts**
- **Certificate Course**
  - Dates available upon request
  - 4 days of attendance
  - Prices available upon request
  - German

**Sign up now!**

www.academy.rwth-aachen.de/fine-blanking

**Any more questions?**

Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
### Course Plan (subject to change)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monday</strong></td>
<td><strong>Phase 1: Goal &amp; Scope Definition</strong></td>
</tr>
<tr>
<td>‣ Introduction &amp; expectations</td>
<td>Definition of target and scope of assessment</td>
</tr>
<tr>
<td>‣ Life Cycle Assessment: Introduction and application fields</td>
<td><strong>Phase 2: Life Cycle Inventory (LCI)</strong></td>
</tr>
<tr>
<td></td>
<td>Theoretical background for data collection, building of an LCI model, software tools &amp; data-bases</td>
</tr>
<tr>
<td><strong>Tuesday</strong></td>
<td><strong>Excursion: Company Visit</strong></td>
</tr>
<tr>
<td>‣ Phase 3: Life Cycle Impact Assessment Overview on and computation of environmental impacts based on LCI results</td>
<td>Specific industrial production process in the field of carbon capture and utilisation</td>
</tr>
<tr>
<td>‣ Phase 4: Interpretation and Sensitivity</td>
<td>Portrayal and implementation of LCA in industrial processes of decision-making &amp; case study</td>
</tr>
<tr>
<td><strong>Wednesday</strong></td>
<td><strong>Modelling Course: Case Study</strong></td>
</tr>
<tr>
<td></td>
<td>Conducting an industry-related LCA case study</td>
</tr>
<tr>
<td>‣ Introduction to a LCA Software</td>
<td>Example Industries: Recycling, Petro, Food, Transport, Energy</td>
</tr>
<tr>
<td>‣ Modelling course: LCI, Allocation, Life Cycle Impact Assessment</td>
<td><strong>Thursday</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CO₂ avoidance cost as a decision-making tool</strong></td>
</tr>
<tr>
<td></td>
<td>Comprehensive communication of LCA results both within the company and towards stakeholders</td>
</tr>
<tr>
<td></td>
<td>Group work: preparation for final presentation</td>
</tr>
<tr>
<td><strong>Friday</strong></td>
<td><strong>Examination (group presentations)</strong></td>
</tr>
<tr>
<td>‣ Prospects of LCA</td>
<td><strong>Networking tip: social event</strong></td>
</tr>
<tr>
<td>‣ Wrap-up Life Cycle Assessment</td>
<td><strong>Scientific lead: Prof. André Bardow</strong></td>
</tr>
</tbody>
</table>

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**Course Characteristics**

<table>
<thead>
<tr>
<th>Math/statistics</th>
<th>little</th>
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<tbody>
<tr>
<td>Process analysis</td>
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<tr>
<td>Process optimization</td>
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<tr>
<td>Competency in methodology</td>
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<tr>
<td>Practical application</td>
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</tbody>
</table>
Life Cycle Assessment (LCA)
The Holistic Environmental Assessment Method for Products and Services

Learn to represent and quantify material and energy flows as input or output values in the various life phases of a product, a procedure or a service. Furthermore, you will acquire the skill to apply the tool Life Cycle Assessment for value chain-oriented decisions in process optimization.

In focus
- Various phases of LCA and their areas of application
- Autonomous implementation of life cycle assessments
- Development of standardized methods for account balancing according to DIN norm
- Interpretation of LCA analyses and evaluation of improvement potentials

Taking on a leading role in environmental protection and thus remaining competitive in a climate-sensitive environment requires many industrial companies to implement key measures to reduce environmental impacts. Suitable activities are determined by a detailed environmental assessment: The so-called "Life Cycle Assessment" offers a commonly accepted and highly effective method to that end.

You are an engineer and/or project leader in the areas of production, environmental management, research and development or strategic management with at least one year of relevant professional experience.

Quick Facts

Certificate Course
- Dates available upon request
- 5 days of attendance
- Prices available upon request
- English

Sign up now!
www.academy.rwth-aachen.de/life-cycle-assessment

Any more questions?
Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
### Course Plan Module I (subject to change)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
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<tbody>
<tr>
<td><strong>Wednesday</strong></td>
<td></td>
</tr>
<tr>
<td>Bitumen technology</td>
<td>Preparation for work</td>
</tr>
<tr>
<td>Asphalt technology</td>
<td>Construction methods: technologies and avoidance of errors</td>
</tr>
<tr>
<td>Cement and concrete technology</td>
<td>Surface characteristics: acoustics</td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
<td></td>
</tr>
<tr>
<td>Technical code I</td>
<td>Surface characteristics: evenness and grip</td>
</tr>
<tr>
<td>Technical code II</td>
<td></td>
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<tr>
<td>Traffic safety obligation</td>
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</tbody>
</table>

### Course Plan Module II (subject to change)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
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<tbody>
<tr>
<td><strong>Wednesday</strong></td>
<td></td>
</tr>
<tr>
<td>Recycling procedures</td>
<td>Large scale experiments - installation section: installation, compression and sampling</td>
</tr>
<tr>
<td>Maintenance and renovation technology</td>
<td>Liability for defects and approval in VOB contract</td>
</tr>
<tr>
<td>Problems known from practical experience</td>
<td></td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
<td></td>
</tr>
<tr>
<td>Laboratory practice: WPK and verification audit</td>
<td>Summary and preparation for exam</td>
</tr>
<tr>
<td>Assessment of results of WPK and verification audits</td>
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<tr>
<td>Networking tip: evening event</td>
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</tbody>
</table>
Road Construction Technology
Optimizing Methods of the Road Sector for Administration and Industry

**Strengthen** your confidence in negotiations regarding liability for defects and approval in the VOB contract and get to know the methods and tools necessary for succeeding in the market in the areas of preparation for work, traffic safety obligation, technical code, installation technology and approval.

**In focus**
- Bitumen, cement, concrete and asphalt technology
- Construction methods: technologies and avoidance of errors
- Autonomous installation of an asphalt layer including sampling
- Laboratory practice: WPK and verification audit

**The maintenance and further development** of some 600,000 km of road network across the country pose great challenges and important tasks to road construction engineers: not least because the codes in earthworks and road construction keep evolving in terms of material characteristics, installation procedures, construction methods and surface characteristics.

**You are** an expert or executive in road construction, at road construction offices, traffic authorities and road administrations, road maintenance depots, private construction companies or technical enterprises for road safety.

**Quick Facts**

Seminar – Certificate of Attendance
- Dates available upon request
- 2 x 2 days of attendance
- Prices available upon request
- German

**Sign up now!**

www.academy.rwth-aachen.de/road-construction-technology

**Any more questions?**

Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
Course Plan (subject to change)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
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<tbody>
<tr>
<td>Monday</td>
<td>Morning</td>
</tr>
<tr>
<td>Lecture and practical training</td>
<td>Lecture and practical training</td>
</tr>
<tr>
<td>Metallurgic basics of aluminum materials</td>
<td>Aluminum recycling from mixed waste</td>
</tr>
<tr>
<td></td>
<td>Lecture and practical training</td>
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<tr>
<td></td>
<td>Extraction and recycling of aluminum</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Afternoon</td>
</tr>
<tr>
<td>Casting technique - metallurgy and processing</td>
<td>Process chain modeling for automotive strip</td>
</tr>
<tr>
<td>Permanent mold process - chill casting</td>
<td>Forming technologies for AL semi-finished products and molded parts</td>
</tr>
<tr>
<td></td>
<td>Plastic forming of aluminum alloys</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Morning</td>
</tr>
<tr>
<td>Joining technology for aluminum alloys</td>
<td>Construction and calculation of Al constructions</td>
</tr>
<tr>
<td>Welding procedures for aluminum alloys</td>
<td>Lecture and practical training</td>
</tr>
<tr>
<td></td>
<td>Wear and corrosion protection of Al elements</td>
</tr>
<tr>
<td>Thursday</td>
<td>Afternoon</td>
</tr>
<tr>
<td>Lecture</td>
<td>Design of cyclically stressed elements from aluminum materials</td>
</tr>
<tr>
<td>Use of aluminum in automotive</td>
<td>Strength tests of Al materials</td>
</tr>
<tr>
<td>Practical training</td>
<td></td>
</tr>
<tr>
<td>Aluminum in automotive construction</td>
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<tr>
<td>Networking tip: evening event</td>
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</tbody>
</table>

Participants praise the extensive insight into innovations of the aluminum-processing sector and the mix of theory and practice.
Familiarize yourself with the material aluminum or deepen your knowledge in the areas of processing and options for application. Beyond the metallurgical basics, you will receive much greater knowledge about the individual process steps during production and further processing of aluminum products.

In focus
- Use of aluminum in automotive construction
- Forming technologies and welding procedures
- Casting technology: metallurgy and processing
- Insight into the research of several institutes of RWTH Aachen

Aluminum is one of the most versatile metals in use: Its low weight, high strength and formability make it a universal material that is used for the manufacture and further processing of high-quality products. As an interdisciplinary research and development partner for industrial application, the aluminum engineering center (aec) offers a pool of highly qualified materials scientists and engineers for future projects.

You are an expert or newcomer in an aluminum-processing company.

Quick Facts

Seminar – Certificate of Attendance
- Dates available upon request
- either 2, 3 oder 4 days
- Prices available upon request
- German

Sign up now!

www.academy.rwth-aachen.de/aluminium-technology

Any more questions?

Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
### Course Plan (subject to change)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
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<tbody>
<tr>
<td><strong>Wednesday</strong></td>
<td><strong>Measuring Equipment</strong></td>
</tr>
<tr>
<td>Introduction &amp; expectations</td>
<td>Overview of sensors and PC-based measurement systems for data acquisition and signal analysis</td>
</tr>
<tr>
<td>- Fundamentals of Vehicle Acoustics</td>
<td>- Measurement rooms like anechoic chamber, reverberation room and aero-acoustic wind tunnel</td>
</tr>
<tr>
<td>- Sound field &amp; sound energy parameters</td>
<td></td>
</tr>
<tr>
<td>- Definition of sound levels</td>
<td></td>
</tr>
<tr>
<td>- Human perception of air-borne and structure-borne noise</td>
<td></td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
<td><strong>Body</strong></td>
</tr>
<tr>
<td>Legislation</td>
<td>Transfer of vibrations (powertrain, tyres, air flow) and radiation into the vehicle’s interior</td>
</tr>
<tr>
<td>- Prevailing regulations (interior and exterior noise)</td>
<td>- Analysis of noise sources and transfer (experimental and simulation methods)</td>
</tr>
<tr>
<td>- Noise measurement procedures and mandatory noise limits</td>
<td>- Measures for reduction of interior noise</td>
</tr>
<tr>
<td><strong>Powertrain</strong></td>
<td>- Psychoacoustic indices</td>
</tr>
<tr>
<td>- Characterisation of sound sources: engine, transmission, shafts and joints</td>
<td>- Measuring techniques and subjective rating methods</td>
</tr>
<tr>
<td>- Electro and hybrid powertrains: new acoustic challenges</td>
<td>- Sound engineering</td>
</tr>
<tr>
<td><strong>Friday</strong></td>
<td><strong>Case Study</strong></td>
</tr>
<tr>
<td>Chassis</td>
<td>Task: reducing a powertrain exited interior noise phenomenon</td>
</tr>
<tr>
<td>- Tyre/road noise (generation mechanisms, measurement procedures and reduction measures)</td>
<td>- Measurements (road/bench tests)</td>
</tr>
<tr>
<td>- Brake systems (generation mechanisms, measurement procedures, reduction measures and noise phenomena)</td>
<td>- Root cause analysis (systems approach)</td>
</tr>
<tr>
<td><strong>Networking tip: social event</strong></td>
<td>- Reduction measure</td>
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<tr>
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<td>- Comprehensive feedback session</td>
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</tbody>
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**Course Characteristics**

- Training exercises: little
- Production optimization: a lot
- Competency in methodology: little
- Practical application: little

---

Scientific lead: Prof. Jan-Welm Biermann
Acquire a particular understanding for vehicle-specific acoustic effect mechanisms and learn to implement the respective remedies in a goal-oriented manner for existing problems.

In focus
- Comprehensive and holistic understanding of the entire vehicle system
- Vehicle-specific acoustic effect mechanisms and remedies for existing problems
- Practical transfer of knowledge with numerous application examples
- Applying the learned knowledge in your own case study

The topic of acoustics is key for developing vehicles achieving high quality standards. The areas of noise, vibration and harshness are essential elements to create a targeted vibration and acoustics behavior.

You are an engineer or technician in the automotive or supplier industry with at least one year of relevant professional experience.

Quick Facts

Seminar – Certificate of Attendance
- Dates available upon request
- 3 days of attendance
- Prices available upon request
- English

Sign up now!

www.academy.rwth-aachen.de/vehicle-acoustics-nvh

Any more questions?

Your Team
Certificate Courses & Inhouse Programs
further-education@academy.rwth-aachen.de
Tel. +49 241 8097865
RWTH Business School combines the scientific expertise of the university and the teaching contents for professional continuing training programs. All of these include both management skills and current technologies in the curriculum, thus optimally preparing executives for the professional challenges of the future.

The curriculum of the Business School is created in close collaboration with the faculty of business sciences of RWTH Aachen university. With its AACSB accreditation, it is among the top 5 percent of business faculties worldwide and holds 2nd place in the current QS-World University Ranking in the German-speaking area.
Course Plan (example)

**Monday**
- Relevance of Digital Transformation
- Framework for Digital Transformation

**Tuesday**
- Challenges in Cloud Transformation: The Microsoft Case
- Technology Base Software Platforms and Workshop

**Wednesday**
- Initiation Strategies for Digital Transformation
- Business Ecosystems and Platform Economy
- Leadership Organization

**Thursday**
- Leadership Behavior & Culture

**Friday**
- Leadership Roadmap to Digital Transformation
- Digital Transformation Readiness Assessment

**Afternoon**
- Managing Digital Transformation Strategically
- Principles & Foundations for Digital Transformation
- Challenges and Opportunities in IoT Transformation
- Technology Base Software Platforms II and Tour
- Transformation Governance
- Leadership Behavior & Culture II
- Exam

Networking tip: outdoor training and evening at an open fireplace
**Gain** an overview of the fundamental patterns, strategies and design approaches of the digital transformation. You will learn which challenges and opportunities can arise through digitalization in a company and in particular for its leadership. You will go through the concepts of change management and the digitalization process, independently applying analysis procedures.

**In focus**
- Fundamentals of platform economy
- Data-based organization design and value creation
- Recognizing business model transformations and innovations
- Case studies on leadership and change management

**In the digitally networked economy**, the use of social networks, technologies and cloud computing offers radical approaches for redesigning business models, value creation processes and working systems. Thus, companies face the task of implementing content-related changes with all their complexity while at the same time ensuring a successful transformation. You will be facing the challenge of designing new structures and systems to replace established behavioral patterns.

**You are** an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

**Quick Facts**
- **Certificate Course**
  - Dates available upon request
  - 4,5 days of attendance
  - Prices available upon request
  - German and English

**Sign up now!**
www.business-school.rwth-aachen.de/digital-leadership

**Any more questions?**
Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
### Course Plan (example)

<table>
<thead>
<tr>
<th>Morning</th>
<th>Afternoon</th>
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</thead>
<tbody>
<tr>
<td><strong>Monday</strong></td>
<td><strong>Design Thinking</strong></td>
</tr>
<tr>
<td>Digital Transformation Management Methodology</td>
<td>Design Thinking Cases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tuesday</strong></th>
<th><strong>Design Thinking Workshop</strong></th>
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<tbody>
<tr>
<td>Design Thinking Workshop</td>
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<table>
<thead>
<tr>
<th><strong>Wednesday</strong></th>
<th><strong>Digital Transformation Canvas</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Innovation: DevOps Discussion</td>
<td>Part 1: Heatmap Design</td>
</tr>
<tr>
<td>Part 2: Transformation Roadmap Design</td>
<td>Part 3: Case Application of Methodologies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Thursday</strong></th>
<th><strong>Case Study Consolidation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Transformation Canvas Part 4: Value Centered Engagement</td>
<td>Case Study Discussion</td>
</tr>
<tr>
<td>Part 5: Case Application of Methodology</td>
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<tr>
<td>Part 6: Designing Behavioral Change</td>
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<thead>
<tr>
<th><strong>Friday</strong></th>
<th><strong>Exam</strong></th>
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<tbody>
<tr>
<td>Case Study Presentation Group Discussion</td>
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</table>

- Networking tip: outdoor training and evening event
Organize the digitalization process in your company, introduce change and decide which business models are viable. In this certificate course, you will learn, among other aspects by using the approach of “Deep Thinking,” how to analyze and design management.

In focus
- Digital Transformation Methodology
- Design Thinking
- Engineering Innovation
- Digital Transformation Canvas

Using social networking, business analytics as well as Big Data, cloud computing or Augmented Reality allows radical new approaches to redesign business models, value creation processes as well as working systems. Thus, companies face the challenge of mastering the complexity associated with the necessary content-related changes while at the same time ensuring the success and efficiency of the transformation.

You are an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

Quick Facts

Certificate Course
- Dates available upon request
- 4,5 days of attendance
- Prices available upon request
- German and English

Sign up now!
www.business-school.rwth-aachen.de/digital-transformation-management

Any more questions?
Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
### Course Plan (example)

<table>
<thead>
<tr>
<th>Monday</th>
<th>Afternoon</th>
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<tbody>
<tr>
<td>Success factors from management to breakthrough innovations</td>
<td>Basics of agile product development</td>
</tr>
<tr>
<td></td>
<td>Development of a user story</td>
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<thead>
<tr>
<th>Tuesday</th>
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<tbody>
<tr>
<td>Agile workshop – user story</td>
<td>Agile development in the context of mechatronic systems</td>
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</tr>
<tr>
<td>Leadership e.GO Mobile AG</td>
<td>Agile workshop – transitioning user stories into development</td>
<td></td>
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<thead>
<tr>
<th>Wednesday</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Agile workshop - minimum viable product</td>
<td>Workshop - fields of action for implementing agile product development</td>
<td></td>
</tr>
<tr>
<td>Agile workshop - the finished product</td>
<td>Basics for incubators</td>
<td></td>
</tr>
<tr>
<td>Practical example from the industry</td>
<td>Design of incubators</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Thursday</th>
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<tbody>
<tr>
<td>Integrating incubators into existing structures</td>
<td>Innovation networks for agilization</td>
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<tr>
<td>Corporate start-up cooperation</td>
<td>Agile company</td>
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<tr>
<td>Workshop fields of action for the implementation of an incubator</td>
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<table>
<thead>
<tr>
<th>Friday</th>
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<tbody>
<tr>
<td>Leadership 4.0</td>
<td>Exam</td>
</tr>
<tr>
<td>Workshop - agile learning</td>
<td></td>
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<tr>
<td>Wrap-up and preparation for exam</td>
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</tbody>
</table>

Networking tip: outdoor training and evening event
Smart Product Development
The Innovative Path to the Value Chain of the Future

Get qualified to implement an agile development process in the context of Industry 4.0. You will understand the backgrounds and processes of agile developments as well as the customer-oriented design of intelligent products. The learned methods allow you to adaptively react and achieve higher flexibility and efficiency.

In focus
- Agile development in the context of mechatronic systems
- Leadership 4.0 and change management
- Integration of incubators into existing structures
- Workshop: fields of action for implementing agile product development and much more

Intelligent, networked products lead to both new opportunities as well as potential challenges for business. Such revolutions take place primarily in the manufacturing sector: The creative use of data unlocks a multitude of possibilities and business models. It represents an important competitive factor along the product life cycle and is key for the value chain of the future.

You are an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

Quick Facts

Certificate Course
- Dates available upon request
- 4.5 days of attendance
- Prices available upon request
- German and English

Sign up now!
www.business-school.rwth-aachen.de/smart-product-development

Any more questions?
Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
Course Plan (example)

Morning                                      Afternoon
Monday   Introduction: smart production and   Interactive tour: Industry 4.0 in the demonstration factory
       Industry 4.0                                                Company-specific Industry 4.0 roadmaps
Tuesday  Production Analytics – potentials & applications in production
        Production planning & control: Data-based support for decision-making
        From data mining to artificial intelligence in production
Wednesday  Data mining and predictive analytics tools and workshop
             Selection and introduction of smart devices on the shop floor
             Planning game: the workplace of the future with smart devices
Thursday  Mobile end devices in manufacturing – Flexibilization of employees
           From the internal value chain to the cross-company value network – potentials and challenges
           Planning game: the value network of the future
           IPT tour: smart production from turbine blade processing to stem cell production
Friday   Industry 4.0 road mapping: Horizontal & vertical integration in smart production
         World Café: company-specific Industry 4.0 roadmaps
         Best practices: Industry 4.0 road mapping from smart production areas
         Exam

Networking tip: outdoor training and evening event

Course Characteristics

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<tr>
<th>Math/statistics</th>
<th>Programming</th>
<th>Production optimization</th>
<th>Management</th>
<th>Competency in methodology</th>
<th>Practical application</th>
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<td>a lot</td>
<td>little</td>
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</table>

Participants praise the concentrated competence as well as the knowledge of the lecturer.

Scientific lead: Dipl.-Ing. Toni Drescher
Master the problems of the growing product diversity, shorter product life cycles and increasing customer demands. Learn to satisfy these requirements with adapted production conditions. Moreover, you will develop a practical understanding of successful Industry 4.0 applications and technologies for intelligent production.

In focus
- Data-based support for decision-making
- Intelligent production systems linked to logistics and automation systems
- Development of roadmaps
- Planning games

Smart production systems are approaches to solutions closing gaps between data-, technology- and process-oriented production designs. With that, the challenges of today’s production conditions can be overcome. That is because many companies in the manufacturing industry have to act more intelligently and proactively as well as produce more flexibly and efficiently. This can only be achieved with intelligent networking and digitalization.

You are an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

Quick Facts
Certificate Course
- Dates available upon request
- 4,5 days of attendance
- Prices available upon request
- German and English

Sign up now!
www.business-school.rwth-aachen.de/smart-production

Any more questions?
Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
Participants praise the teaching methods and the practical relevance for their professional work.

Course Characteristics

<table>
<thead>
<tr>
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Course Plan (example)

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<th>Afternoon</th>
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<tbody>
<tr>
<td>Monday</td>
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<tr>
<td>Basics cryptology/IT security</td>
<td>IT security management</td>
</tr>
<tr>
<td>Tuesday</td>
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<tr>
<td>Industrial IT security</td>
<td>Penetration Testing</td>
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<tr>
<td>Industry 4.0</td>
<td>Awareness</td>
</tr>
<tr>
<td>Wednesday</td>
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<tr>
<td>KRITIS</td>
<td>Data protection and data security</td>
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<tr>
<td>IEC 62443</td>
<td>General Data Protection Regulation</td>
</tr>
<tr>
<td>Thursday</td>
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<tr>
<td>General Data Protection Regulation</td>
<td>Data protection impact assessment</td>
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<tr>
<td>Privacy by Design</td>
<td>Data protection engineering I</td>
</tr>
<tr>
<td>Friday</td>
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<tr>
<td>Data protection engineering II</td>
<td>exam</td>
</tr>
<tr>
<td>Preparation for exam</td>
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</tbody>
</table>

Networking tip: outdoor training and evening event
Meet the challenges of data-driven decision-making in companies with suitable technical implementations and learn how to professionally secure the processing of data.

In focus
- Problems of data quality and its consequences
- Effects of data security and protection as well as the possible legal consequences when processing data
- Case study on data management and security in the company context
- Methods and techniques (for securely dealing with data)

The use of data offers opportunities for developing new business models as well as improving existing value chains with data-driven decision-making. Reliable processing of data plays a key role here and is the basic precondition for the use of machine learning and artificial intelligence in a company. Moreover, securely handling data is a relevant aspect as they often contain valuable operating information.

You are an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

Quick Facts

Certificate Course
- Dates available upon request
- 4,5 days of attendance
- Prices available upon request
- German and English

Sign up now!
www.business-school.rwth-aachen.de/data-management-security

Any more questions?
Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
### Course Plan (example)

<table>
<thead>
<tr>
<th>Day</th>
<th>Morning</th>
<th>Afternoon</th>
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</thead>
<tbody>
<tr>
<td>Monday</td>
<td>Introduction Predictive Enterprise &amp; Data Science</td>
<td>Heuristic optimization</td>
</tr>
<tr>
<td>Tuesday</td>
<td>Value added in the algorithmic economy</td>
<td>Evaluation of use cases, Statistics and probability</td>
</tr>
<tr>
<td>Wednesday</td>
<td>Machine Learning &amp; Artificial Intelligence (AI)</td>
<td>Evaluation of prognoses, Decision Bias</td>
</tr>
<tr>
<td>Thursday</td>
<td>Case study, Data Science Hands-on</td>
<td>Typical pitfalls, Change Management, DevOps</td>
</tr>
<tr>
<td>Friday</td>
<td>Visualization, Preparation for exam</td>
<td>Exam</td>
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</tbody>
</table>

- Networking tip: outdoor training and evening event

### Course Characteristics

<table>
<thead>
<tr>
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<tr>
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<tr>
<td>Practical application</td>
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</table>

Participants praise the practical relevance and the newly acquired approaches.
Get to know methods and applications of data science, machine learning and artificial intelligence. The detailed analysis of case studies will allow you to implement data-based decision-making. You will learn how to turn an idea into a tangible project and how the success of data-driven decision-making can be evaluated in daily business.

In focus
- Data science in project & change management
- Basics of artificial intelligence and data science
- Practical use & business cases in the context of data science
- Predictive enterprise

Industry 4.0, artificial intelligence, machine learning – the entire economy is heading towards a huge disruption centered on the digitalization of the value chain. Data as such are only the first step while the use of advanced algorithms permits converting data into value.

You are an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

Quick Facts

Certificate Course
- Dates available upon request
- 4,5 days of attendance
- Prices available upon request
- German and English

Sign up now!
www.business-school.rwth-aachen.de/data-science-digital-economy

Any more questions?
Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
### Course Plan (example)

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<tbody>
<tr>
<td><strong>Monday</strong></td>
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<tr>
<td>Industrialization „From Taylor to Toyota – and beyond“</td>
<td>Data CLAAS Excellence System (CXS)</td>
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<td>Information systems in production and logistics</td>
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<td>Implementing company strategy through process management</td>
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<tr>
<td><strong>Tuesday</strong></td>
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<tr>
<td>Process management in production systems</td>
<td>Practical process modeling with Sycat</td>
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<tr>
<td>The Aachen PPS model</td>
<td>IuKT in processes</td>
</tr>
<tr>
<td>Process modeling</td>
<td>Fireplace evening <em>Leadership in Production Systems</em></td>
</tr>
<tr>
<td><strong>Wednesday</strong></td>
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</tr>
<tr>
<td>Business IT alignment</td>
<td>Planning game &quot;Grab@pizza&quot;</td>
</tr>
<tr>
<td>IT and business – more than a marriage of convenience?</td>
<td>Formulation and implementation of IT strategies</td>
</tr>
<tr>
<td><strong>Thursday</strong></td>
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<tr>
<td>Business application navigator</td>
<td>Benefit assessment of process and IT integration</td>
</tr>
<tr>
<td>Machine learning in practice</td>
<td>Management of IT companies</td>
</tr>
<tr>
<td>Master data and process management – Data governance (incl. Data Q)</td>
<td>Internet of Production &amp; exam notes</td>
</tr>
<tr>
<td><strong>Friday</strong></td>
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<tr>
<td>Maturity model for the introduction of Industry 4.0</td>
<td>Exam</td>
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<tr>
<td>Use cases in reality</td>
<td></td>
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</tbody>
</table>

- Networking tip: outdoor training and evening event

### Course Characteristics

- **Math/statistics**: little
- **Programming**: a lot
- **Production optimization**: little
- **Management**: a lot
- **Competency in methodology**: little
- **Practical application**: a lot

Participants praise the high relevance for practical application as well as the solidifying of learned methods and techniques in the simulation game.

Scientific lead: Prof. Volker Stich
**Process & IT Management in Production Systems**

Understanding and Applying Lean Production in Companies

**Get to know** the basics of production systems as a framework for manufacturing companies. You will learn how process management can serve as the link between company control and its implementation in daily operations. Moreover, you will get to understand the essential characteristics and components of production plants and develop a comprehensive know-how on designing and optimizing business processes.

**In focus**
- Basics of process and IT management in production planning
- Operationalization of strategic goals
- Interdisciplinary planning games: IT and business
- Visit of the demonstration factory

**The successful use of operational application systems such as ERP and MES** has been a key success factor even before the digital transformation.

**You are** an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

**Quick Facts**

- Certificate Course
  - Dates available upon request
  - 4.5 days of attendance
  - Prices available upon request
  - German and English

**Sign up now!**


**Any more questions?**

Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
Participants praise the newly acquired approaches and contacts

Course Plan (example)

<table>
<thead>
<tr>
<th>Morning</th>
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<tbody>
<tr>
<td>Monday</td>
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<tr>
<td>Factory planning – setting goals</td>
<td>Factory planning - determining fundamentals incl. exercise</td>
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<td>Factory planning - concept planning incl. exercise</td>
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<tr>
<td>Tuesday</td>
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<tr>
<td>Group exercise: characteristic date line</td>
<td>Case study: data analysis</td>
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<tr>
<td>Storage processes: analysis &amp; controlling</td>
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<tr>
<td>Wednesday</td>
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<tr>
<td>Provision diagram</td>
<td>Lean production</td>
</tr>
<tr>
<td>Planning game &quot;Designing lean supply chains&quot;</td>
<td>Production planning and control</td>
</tr>
<tr>
<td>Thursday</td>
<td></td>
</tr>
<tr>
<td>Planning game &quot;Designing lean supply chains&quot;</td>
<td>Logistic modeling of production processes</td>
</tr>
<tr>
<td>Friday</td>
<td></td>
</tr>
<tr>
<td>Logistic modeling of production processes (application)</td>
<td>Summary of key contents</td>
</tr>
<tr>
<td>Group exercise: the influence of the decoupling point of customer orders on logistics performance and costs</td>
<td>Exam</td>
</tr>
<tr>
<td>Networking tip: outdoor training and evening event</td>
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Scientific lead: Prof. Peter Nyhuis
Production Management & Logistics
Together, We Are (More) Successful - the Meaning of Coordinated Action

You will learn to recognize the relevance of logistical target figures and how to use the models to assess design alternatives in internal supply chains. Moreover, you will understand how to identify logistical weaknesses in the internal supply chain and how to implement respective improvement measures.

In focus
- Coordinated action of process owners
- Operationalization of strategic goals
- Planning game on concept planning in the context of planning a factory
- Practical work on cases & case examples

Aside from the coordination of company-wide material flows and supply relationships, the holistic view of logistical target figures along the internal supply chain of a company is an essential component of the analysis and design of logistical performance characteristics. Cause-effect relationships between the logistical target figures of individual elements in the internal supply chain have to be known in order to describe the effects of planning and control decisions.

You are an expert or executive in an industrial or service company with at least three years of professional experience and the desire to hone your profile and extend your professional horizon.

Quick Facts

Certificate Course
- Dates available upon request
- 4.5 days of attendance
- Prices available upon request
- German and English

Sign up now!

www.business-school.rwth-aachen.de/production-management-logistics

Any more questions?

Aline Wesner
Chief Operating Officer
a.wesner@business-school.rwth-aachen.de
Tel. +49 241 8027719
Customized Inhouse Programs

Do you need an individual and customized solution for advanced training to strategically accompany your company goals? Not a problem. With us, you can book inhouse courses for your staff development. We will make your employees, teams or entire organizations fit for the future - whether for regular advanced training, retraining or as part of large change processes in the corporate culture.

We will consistently implement the planned training solution for your employees: planning, conception, execution and follow-up. Together with you, we will determine the training needs of employees and develop a concept that is strategically and situationally suitable for your changing business processes.

The resulting education concepts are presented in a first-rate didactic manner and address your company-internal questions with a high relevance for practical application. Depending on the knowledge level of the employees, this can range from basic over advanced to specialist training.

Because of our long experience as providers of further education, we will create a training package specifically tailored to the topic for your experts and executives.

As per your decision, the courses will be held at your company site, at RWTH International Academy or as a webinar or in conjunction with e-learning components. Participants learn from the competent lecturers of RWTH International Academy and receive a certificate after successfully passing the exam.

We're happy to advise you on details and send you a non-binding offer. Contact us at:

Mrs. Kim Schönberg
Program Manager
Certificate Courses & Inhouse Programs
Tel.: + 49 241 8097865
Inhouse-courses@academy.rwth-aachen.de

Quick Facts:
- Individual basic or advanced training
- Online and attendance units at the company or at RWTH Aachen
- Case studies, practical examples, laboratory tours and company-specific project phases
- Executive Certificate from RWTH Aachen
Great choice in pick & mix

- ROS
- KI
- AR
- CPS
- 6σ
- and much more

- Project consulting
- Case studies & practical examples
- Basic and advanced courses
- Online modules
Rely on the high academic quality of RWTH International Academy, reflected in the following 3 characteristics:

1. **Excellent teaching quality**
   Course participants are taught by numerous scientists and leading minds of the renowned RWTH Aachen. 80 percent of the university’s professors have professional experience from industry and the business world. They directly convey their practical experience to our course participants, merging academic and professional education.

2. **First-class teaching conditions**
   Small groups allow effective solutions to be worked out together. That is because the advanced training offers of RWTH Aachen are consciously oriented towards the user and impartial towards producers, tailored to the professional reality of the respective participant and the diverse enterprises.

3. **Enthusiastic graduates**
   The positive feedback of our graduates confirms our quality motto, that we are only successful if you are after your advanced training. Graduates attest the targeted development of competencies and praise the comprehensive and visual qualification they gained through the certificate of completion from RWTH Aachen. They benefit from career-promoting networks and the lively exchange with lecturers and participants in the long term.
Erfolgreich sein
Registration
Simply register via our online registration portal www.academy.rwth-aachen.de/certificate-courses or via fax at + 49 241 8092525. The registration becomes legally binding with our written confirmation. Any legally binding registration is based on general terms and conditions. Should you have any questions beforehand, we will be happy to help you at any time.

Payment
After successful registration, you will receive the bill via e-mail, to be paid by money transfer. In the case of non-payment, we reserve the right to cancel the registration and re-assign the spot. Should you default on payment, we are entitled to demand interest on arrears to the amount of 5 % above the basic interest rate (Act. 247 Par. 1 BGB) p.a.

Site of the event
We will gladly welcome you - for the majority of courses - at RWTH International Academy on Campus Boulevard 30 in Aachen. You can get a first impression of our modern facilities with the virtual tour at www.campusraum.de. Some courses additionally offer the opportunity to visit laboratories or to take part in excursions. About two weeks prior to the start of the course, you will receive more detailed information on the site of the event and the course program via e-mail.

Food
If you use one of our recommended hotels, breakfast is included in the price of the room. During the seminar days, we take care of your culinary needs: Depending on the course, breakfast or lunch as well as drinks during the seminar hours are included. You may be responsible for the remaining food needs, but we can surely offer you a good tip where to eat well in Aachen.

Lodging
To make it easier for you to find lodging, we are happy to recommend hotels. We provide reserved hotel contingents which may be booked up to one month prior to the start of the course. Feel free to talk to us about this. You will bear the resulting costs.

Arrival and departure
Please organize your travel arrangements by yourself as these are not included in the fee. You will receive directions to the site of the event about 2 weeks prior to the start of the course. We will happily provide you with a parking permit, if needed. That way, you can arrive without worries and entirely focus on your advanced training.

Course documents
To support and solidify your newly acquired knowledge, you will receive high-quality course documents.
Number of participants
To promote the individual learning process and lively discussions between participants and lecturer, we limit the maximum number of participants to 15 to 20 persons. The minimum number of participants is generally set at 7 persons.

Networking
For most courses, we happily invite you to a joint evening event. Explore the imperial city of Aachen and use the opportunity for exchange with other participants and the lecturers in a comfortable setting.

Costs
You can find the costs of the individual courses in the respective course descriptions in this brochure. This fee is exempt from V.A.T. according to Art. 4 Para. 21 a) bb) UStG. Course documents and framework program are included, but not the costs for lodging or travel arrangements.

Cancellation
Should your plans change and you have to cancel your registration, this has to be done in writing. For cancellations up to 60 days prior to the start of the event, no cancellation fees are due. Up to 30 days prior to the start of the event, cancellation fees to the amount of 20 % of the participation fee are due. Should the cancelation arrive up to 14 days prior to the start of the event, cancelation fees to the amount of 50 % of the participation fee are due. In the case of non-attendance without a cancelation, the entire participation fee is to be paid. There is no claim for partial or entire reimbursement of already paid event fees in the case of illness or prematurely departing from the course. Should, despite expectations, too few participants register for an event, we reserve the right to call off the event. Participants will be reimbursed in full for already paid fees. Further claims, in particular reimbursement for travel and lodging costs as well as working hours missed, are excluded.

Further information
The course descriptions in this brochure represent the most important components of each training unit. Should you have further questions, visit us at: www.academy.rwth-aachen.de/certificate-courses

Contact
Of course, we will be happy to personally help you:

Jael Schröder: +49 241 8023682
Sonja Kaufmann: +49 241 8097742
Kim Schönberg: +49 241 8097865
Aline Wesner: +49 241 8027719
further-education@academy.rwth-aachen.de

Data protection
You can find information on our data protection regulations on our website at: www.academy.rwth-aachen.de/en/index/privacy
Hereby, I bindingly register for the course

The participation fee includes the course documents, food during the course and the framework program. The course is exempt from V.A.T. taxation according to Art. 4 Para 21a bb) USTG. You can look at the terms and conditions at: www.academy.rwth-aachen.de/en/terms-and-conditions

Registration Form

Title  Last name*

Company/institute*

Department

Street*

Country*

Phone*

Date*

First name*

Position

P.O. Box*

ZIP code/city*

Fax

E-mail*

Signature*

*These data are required.

Registration
You may sign up via e-mail, fax or our electronic registration portal on the website of RWTH International Academy. The registration is binding by law upon written confirmation by RWTH International Academy. All legally binding registrations are based on the general terms and conditions. The participation fee is due after receipt of the bill and to be paid by money transfer. Should the fee not be paid, RWTH International Academy reserves the right to cancel the registration and re-assign the slot. Should a participant default payment, RWTH International Academy has the right of demanding interest on arrears to the amount of 5 % above the basic interest rate (Art. 247 Par. 1 BGB) p.a.

Cancellation
The cancelation has to be declared in written form. If canceled up to 60 days prior to start of the event, no cancelation fees will be demanded. Up to 30 days prior, cancelation fees to the amount of 20 % of the participation fee are demanded. If canceled up to 14 days prior, cancelation fees to the amount of 50 % of the participation fee are due. In the case of non-attendance without cancelation, the full participation fee has to be paid. Should, contrary to expectation, too few participants sign up for an event, RWTH International Academy reserves the right to call off the event. Participants will be reimbursed in full for the already paid fees. Further claims, in particular reimbursement for travel and lodging costs as well as lost work time, are excluded.

Data Protection
With the registration, you declare your consent of your name and business address being included in the list of participants and these being electronically processed and stored for the purposes of the event organization.

Send this registration form by post, by fax or by e-mail to:

RWTH International Academy gGmbH
Certificate Courses & Inhouse Programs
Campus-Boulevard 30
Cluster Produktionstechnik
52074 Aachen
Fax: + 49 241 8092525
further-education@academy.rwth-aachen.de

The participation fee includes the course documents, food during the course and the framework program. The course is exempt from V.A.T. taxation according to Art. 4 Para 21a bb) USTG. You can look at the terms and conditions at: www.academy.rwth-aachen.de/en/terms-and-conditions
You would like to register for a course of RWTH International Academy or receive further information? We are happy to help:

Jael Schröder  
Head of Certificate Courses & Inhouse Programs  
+49 241 8023682  
J.Schroeder@academy.rwth-aachen.de

Sonja Kaufmann  
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