

Certificate course



**WBA  
WERKZEUGBAU  
AKADEMIE**



## Expert Industrial Tool and Die Making

Technologies and strategies  
for a sustainable tool and die making



# Overview of the certificate course

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## ▶ What we offer:

The certificate course 'Expert Industrial Tool and Die Making' of the WBA Aachener Werkzeugbau Akademie (WBA) contains essential core elements of industrial tool making and conveys to the participants concrete concepts and methods, with which traditionally more skilled tool-making companies can develop into industrial tool-making companies of international standard. Upon completion of the course, participants will be able to use current manufacturing technologies to optimize tooling processes, detect tool damage, and self-remediate. They acquire competences for the design, control and documentation of manufacturing processes as well as for the application of computer-aided design methods. Using the right models, participants will be able to plan, implement and optimize tooling services as well as independently develop and manage maintenance strategies. Furthermore, they learn to develop and implement automation solutions and apply numerical methods and simulation methods independently.

## ▶ Target group:

Manufacturing Professionals and Operational Leaders in Toolmaking at Mexican Automobile Manufacturers and Suppliers.





## Course Objective:

The increasing demand for highly complex tools poses a major challenge for the Mexican automotive sector. Currently neither OEMs and suppliers nor specialized toolmakers are able to meet the growing demand for new tools. WBA's „Expert Industrial Tool and Die Making“ training program aims to remedy this shortcoming and also provide tool repair and maintenance know-how. Faster availability of the tools needed will make WBA's offer to positively impact both the productivity and technical adaptability of the Mexican automotive sector.



## Key skills to be acquired:

Course participants acquire in-depth knowledge and relevant competences in different thematic fields of industrial toolmaking:

- Manufacturing technologies: materials, processes, strategies
- Design theory as well as materials and surface technology: Foundations of manufacturing and materials technology, methods and procedures of surface technology and concept development in design
- Repair and service/maintenance: origin and repair of damages, maintenance as a service
- Process and project management/ work organization: design of manufacturing processes, planning and managing projects, work organization, logistics services and operational networks
- CAD-CAM-NC chain and automation / simulation: characteristics and problems, computer-aided design methods, possibilities of automation, applications of requirement-specific CAD and CAM methods, numerical methods, use of simulation methods



## Certificate and examination modalities:

The course 'Expert Industrial Tool and Die Making' is a WBA certificate course. The recognized certificate will be handed over after successful completion of the exam. Thorough preparation for the exam and meaningful training materials are ensured by the instructors. In case of failure of the test, a repetition is possible.



## Course concept:

The teaching and learning content is taught in the form of an innovative blended learning concept: classical classroom sessions with digital lectures, flipped classroom concepts, interactive workshops and live broadcasts, as well as teaching sessions that learners develop through self-study. The exact combination of the different teaching and learning methods will be adapted to the individual needs of the interested companies and the requirements of the course participants.

# Organization

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The certificate course “Expert Industrial Tool and Die Making“ is offered by the WBA Aachener Werkzeugbau Akademie. The WBA is active in the fields of research, industry consulting and training. It was founded in 2010 as a spin-off of the machine tool laboratory WZL of the RWTH Aachen and the Fraunhofer Institute for Production Technology IPT. With over 80 member companies (including Audi, Daimler, Hirschvogel, Rathgeber), it develops innovative solutions for toolmaking. By mapping the entire process chain of toolmaking, new solutions can be tested in our own state-of-the-art machinery. Accordingly, new ideas and technologies for the industry are being developed and piloted in the demonstration world of the WBA at the RWTH Aachen Campus. In this context, the WBA is built on its extensive international experience in consulting and continuing education in the automotive sector.



# Module Overview “Expert Industrial Tool and Die Making”

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## Manufacturing technologies

In the WBA certificate course, interconnections and procedures in sheet metal and massive forming are presented and load collectives in forming technology are discussed. In addition, the topic of plastic forming and the limits of injection molding tools will be covered intensely.

- **Conventional manufacturing processes**

This topic area focuses on conventional manufacturing processes such as milling, drilling, turning, eroding and grinding. These manufacturing processes will be explored in depth, and characteristics of high-performance machining that contribute to increased productivity and efficiency will be addressed. Participants will learn, for example, how process parameters can be optimized.

- **State of the art in sheet metal and massive forming technology**

The topic area deals with the state of the art and the presentation of new processes in sheet metal and solid forming. New developments in sheet metal separation will also be explained.

- **Forming of plastics**

In this topic area, process sequences, material properties, the corresponding physical foundations and machine and tool technology for the various forming processes for plastics are presented. The focus of this topic area is in particular on the processing of plastics and injection molding.



## Design theory/ Materials and surface technology

Participants will gain an overview of the relevant foundations of materials technologies. They get to know the materials to be used and understand how the procedures are linked to form effective process chains. On this basis, methods and procedures of surface technology and for concept development in design theory are explained.

- **Materials**

The topic area focuses on steel, aluminum, titanium and nickel alloys, which are frequently used in toolmaking. The aim is to build an understanding of the properties and machinability of materials and to demonstrate the variability of material properties through alloying elements and heat treatments. Participants will learn about the different material properties as well as advantages and disadvantages in order to be able to make a targeted material selection.

- **Methods for surface technology**

The topic area provides information on methods for the defined generation and characterization of material surfaces and for influencing surface properties. Furthermore, participants acquire the material science knowledge that is necessary for surface technology and gain advanced knowledge in the field of coating technology.

- **Concept development for design**

A deepened understanding of the relevant solution methods for constructive tasks and methods for concept development are dealt with in the topic area. In the end, participants master the systematics of designing technical products in the field of toolmaking.

# Module Overview “Expert Industrial Tool and Die Making”

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## Repair and service/Maintenance

The participants gain in-depth knowledge on issues of tool damage and its characteristics. They will learn about repair options as well as product-related services and develop an understanding of how to plan and implement maintenance as a service

- **Maintenance of technical systems**

Maintenance contributes significantly to added value. Thus, companies aim to avoid failures and to ensure uninterrupted functionality through the implementation of planned maintenance activities. Participants will be able to select an appropriate maintenance strategy, taking into account a given budget, current capacities and available resources. In addition, the most important key figures in maintenance as well as the use of data analytics are discussed.

- **Industrial services and their optimization**

The topic provides the participants with a deep and detailed insight into industrial services and their optimization. The subject of this topic is the importance of services and innovations for the entrepreneurial success. In addition, established business models for services are provided. In a workshop and practical course, approaches for the evaluation of services and a conventional predictive maintenance are developed in practice.

- **Service Engineering**

The topic is service engineering, the systematic development and design of services using appropriate models and methods. The participants will learn the basics of the services, taking into account current developments in science and practice. They will also learn how to interpret organizational structures and processes, and how to market and distribute developed services to limit risks and minimize cost.

## Process and project management/ Work organization

The participants will gain in-depth knowledge of process and project management in toolmaking. They will understand how manufacturing processes in toolmaking can be designed, documented, controlled and improved, including the particular difficulties this entails. They will learn how to initiate, plan, steer and control projects and how to successfully complete them. In addition, the topic of work organization plays an important role. After the presentation of logistics services, it will be explained how operational networks are strategically developed.

- **Process and project management**

In this topic, the focus is first on process management. Process management includes designing, documenting, controlling, and improving business processes. The focus here is on the three central issues of customer expectations and requirements, competition challenges and shareholder expectations. The second part of the topic deals with project management. The focus is on successfully initiating, planning, controlling, controlling and completing projects.

- **Work organization**

The work organization describes the delegation of responsibilities regarding tasks and the direct or indirect cooperation of persons with work objects as well as information and resources in an organization. A special focus is on workplace design. Participants will learn how to design a workplace so that it can be physically and mentally appropriate as well as performance-enhancing. In addition, various working time models are presented.

- **Logistics**

Logistics today occupies a key position within the company's task areas and has a significant impact on the company's performance. Initially, internal and external logistics services will be discussed and models of enterprise logistics will be presented based on them. It looks at in-house and cross-enterprise processes to help participants learn how to strategically design and plan operational networks.



## CAD-CAM-NC-Chain and Automation/ Simulation

Participants will acquire a broader understanding of the properties and problems of the CAD-CAM-NC chain in toolmaking. They will receive computer-aided design methods and will be able to apply requirement-specific CAD and CAM methods. The possibilities and limits of automation are also applied to the application possibilities of different simulation methods, simulation tools and the application of numerical methods.

- **Automation of plants and machines**

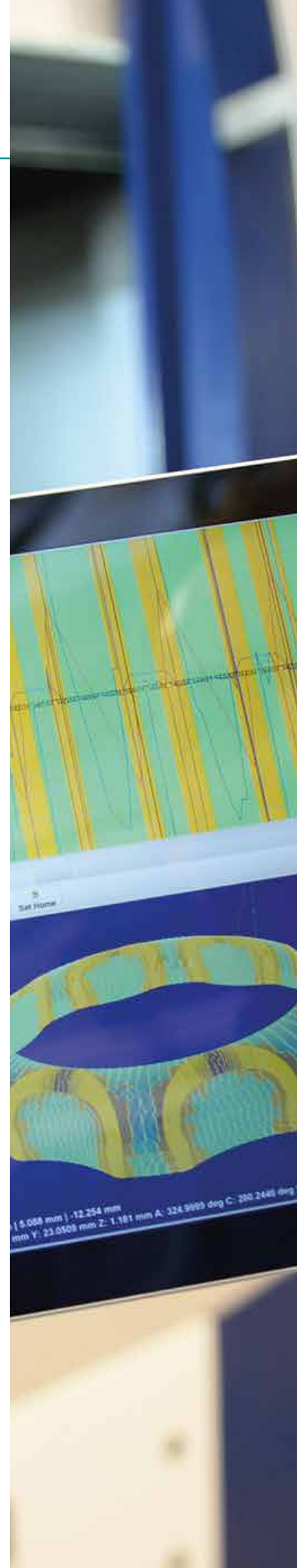
Automation refers to all measures for completely or partially autonomous operation of processes that are automatically controlled according to a previously created program without human intervention. This requires mechanization and control technology. The aim of the topic is to give the participants an overview of the status quo of automation in toolmaking as well as their goals and possibilities. The topic concludes with a specialization in control engineering to provide initial insights into the practical implementation of automation.

- **CAD/ CAM with various PLM, CAD and CAM systems**

In this subject area, the construction of modern numerical control systems (Numerical Control, NC) will be presented. Afterwards, the participants will get an overview of the various NC programming procedures that can be used to program NC controllers in industrial everyday life. The advantages and disadvantages as well as the fields of application of the individual NC programming methods are highlighted. A special focus is placed on NC programming by means of CAM systems. Finally, they will look at Product Lifecycle Management (PLM) and PLM integration of manufacturing data.

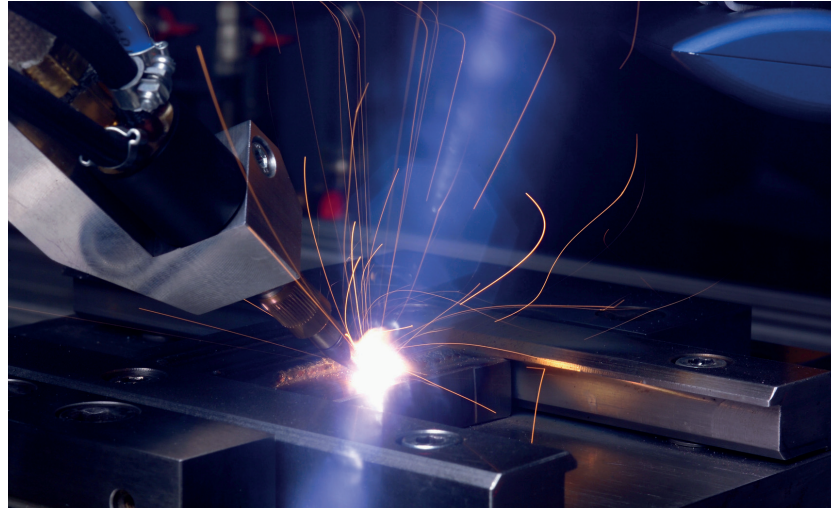
- **Simulation**

The topic is based on the second topic „CAD / CAM with different PLM, CAD and CAM systems“ and places a special focus on current simulation possibilities in practice. Participants will get to know the simulation types: toolpath-based and centered machine simulation, G-code-based and control-based machine simulation and the use of virtual machines. The conclusion of this topic is the advantages and disadvantages of the simulation as well as the essential challenges of virtual machines.





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Certificate course

## Expert Industrial Tool and Die Making

Technologies and strategies for a sustainable tool and die making

### ► Organisation

Duration of the course:	3 courses of 5 days each classroom training
Course location:	Three successive courses will take place at Centro de Vinculación Tecnológica (CVT) de CAINTRA NL. Av. Alianza Centro 505, Parque de Investigación e Innovación Tecnológica, Apodaca, N.L. We also offer the course in-house in your company.
Course fee (plus tax):	1.650 € per person per course
Special fee (plus tax):	4.350 € per person for the 3 courses 1.450 € per person per course, when booking min. 5 persons 3.950 € per person for the 3 courses, when booking min. 5 persons Course materials, refreshments, lunches and two exclusive evening events are included in the price.

The composition and duration of the modules, subject areas and learning units can be individually adapted for your company. If you are interested in an in-house course, we can arrange appropriate discounts for you. An in-house course requires a minimum of 12 participants.

### ► Registration

We recommend a simple and quick online registration (<https://e-mas.de/course-registration/?lang=en>), alternatively for more information; you can contact us on the website (<https://e-mas.de/contact/?lang=en>). You can also contact our local partner KIT Hub, Germán Bonilla Bermúdez ([german@kithub.mx](mailto:german@kithub.mx), tel. +52 1 462 164 3239) for your registration. If we do not receive the written registration within four weeks after the reservation, we reserve the right to assign your provisionally reserved place to another interested party. Registrations will be taken into account in the order in which they are received. If a registration is cancelled later than four weeks before the start of the event, a processing fee of 50% of the participation fee will be charged. If the organizer receives a cancellation later than two weeks before the start of the event, the full participation fee must be paid. The FIR reserves the right to cancel the course due to a shortage of registrations. The course fee will be refunded. The program is subject to alteration.





**Program\* Course 1: Introductory Seminar for  
Expert Industrial Tool and Die Making  
Technologies and strategies for the future of the toolmaking sector**

Monday, 24 <sup>th</sup> of February 2020: Basics of tools	Tuesday, 25 <sup>th</sup> of February 2020: Trends of tools and standardization	Wednesday, 26 <sup>th</sup> of February 2020: Tool Manufacturing
<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Basics of Tools</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Tool Types</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Workshop: Discussion about Participant’s Tools</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Tooling Materials</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Trends in Tooling</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Standardization in Tooling</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Workshop: Standardization Possibilities at Participant’s Tools</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Process Chain of Tool Manufacturing</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Milling Technology I</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Milling Technology II and Discussion about Best Practice</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 EDM I</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 EDM II and Discussion about Best Practice</p> <p>16:30 – 17:00 Review of the Day</p>
Thursday, 27 <sup>th</sup> of February 2020: Tool Manufacturing and Wear	Friday, 28 <sup>th</sup> of February 2020: Exam	
<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Grinding and Polishing Technology I</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Grinding and Polishing Technology II and Discussion about Best Practice</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Application Characteristics of Tools</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Wear Mechanism and Protection</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Wrap-up</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Personal Study Time</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Exam</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Trends in Manufacturing</p> <p>16:30 – 17:00 Review of the Day and Farewell</p>	

\*This itinerary is an example. Customized changes and adjustments are available upon request.



## Program\* Course 2: Practical Seminar CAD/CAM

Technologies and strategies for the future of the toolmaking sector

Monday, 23 <sup>rd</sup> of March 2020: CAD	Tuesday, 24 <sup>th</sup> of March 2020: CAD	Wednesday, 25 <sup>th</sup> of March 2020: CAM
<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Basic Design Concepts</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Analyze and Validate Geometry</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Tooling and Die Design</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Tooling and Die Design</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Tooling and Die Design</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Working with Surfaces</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Assembly design context</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Drawing Process</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Basic manufacturing concepts I</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Basic manufacturing concepts II</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Coordinate Systems</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Milling Operations</p> <p>16:30 – 17:00 Review of the Day</p>
Thursday, 26 <sup>th</sup> of March 2020: CAM	Friday, 27 <sup>st</sup> of March 2020: CAM	
<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Milling Operations I</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Drilling Operations</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 WEDM Operations</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Engrave Text</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Planar Milling</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 3-Axis contouring</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 5-Axis contouring</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Validation &amp; Simulation</p> <p>16:30 – 17:00 Review of the Day and Farewell</p>	

\*This itinerary is an example. Customized changes and adjustments are available upon request.



## Program\* Course 3: Repair and Maintenance

Technologies and strategies for the future of the toolmaking sector

Monday, 11 <sup>th</sup> of May 2020: Materials and Wear	Tuesday, 12 <sup>th</sup> of May 2020: Wear and Repair	Wednesday, 13 <sup>th</sup> of May 2020: Wear and Repair
<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Basic of Tools</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Materials</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Wear characteristics</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Wear characteristics</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Wear mechanisms</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Wear mechanisms</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Basics of repair</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Basics of repair</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Process of Repair</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Process of Repair</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Wear Protection</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Wear Protection</p> <p>16:30 – 17:00 Review of the Day</p>
Thursday, 14 <sup>th</sup> of May 2020: Maintenance	Friday, 15 <sup>th</sup> of May 2020: Exam	
<p>08:30 – 09:00 Welcome</p> <p>09:00 – 10:30 Maintenance</p> <p>10:30 <i>Coffee break</i></p> <p>10:45 – 12:15 Maintenance</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Maintenance</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Maintenance</p> <p>16:30 – 17:00 Review of the Day</p>	<p>08:30 – 09:00 Welcome</p> <p>09:00 – 12:15 Exam</p> <p>12:15 <i>Lunch</i></p> <p>13:15 – 14:45 Outlook</p> <p>14:45 <i>Coffee break</i></p> <p>15:00 – 16:30 Outlook</p> <p>16:30 – 17:00 Review of the Day and Farewell</p>	

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## Course instructor / Contact

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Carmen Halm supervised several national international bilateral projects in the university and research environment at RWTH Aachen University, the German Aerospace Center and the Frankfurt Institute for Advanced Studies including working in press and public relations. In addition, she has worked with a leading e-learning provider on continuing education through digital learning and training media. At the WBA Aachener Werkzeugbau Akademie, she heads the Continuing Education department with a comprehensive range of extra-occupational training formats for toolmaking.

If you have any questions or suggestions regarding the E-Mas continuing education program or the WBA certificate course 'Expert Industrial Tool and Die Making' we look forward to hearing from you!

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