

ADDITIVE ACADEMY: THE WAY TO ADDITIVE SUCCESS



YOUR BENEFITS

Established in
2014

13
different
AM machines

Independent
machine park
and software

Training executed
worldwide

1,200
participants
trained

Excellent
participant
feedback

Choose
your individual
module!

40
experienced
trainers

6
different
AM technologies

ACADEMY



WHAT IT IS ABOUT

The Additive Academy teaches application-based knowledge on subjects related to the industrial use of additive manufacturing (AM). Benefit from the comprehensive expertise of the leading research institution for additive manufacturing technologies. Our training program helps you to identify the opportunities and challenges associated with this innovative production technology and successfully get to grips with them within your own company.

The Additive Academy of Fraunhofer IAPT is your best choice AM training provider, because:

- It is your fast-track solution to obtaining a deep understanding of AM, including its benefits and restrictions
- It teaches your staff with target-group-oriented hands-on training programs
- You learn how to use AM-relevant software and hardware from a neutral user's perspective
- It empowers your team to think out of the box regarding the value chain and product design
- It makes you experience the full range of industrial research and benefit from being one step ahead
- You learn from recent research results how to become a first mover in a fast-developing field
- You benefit from tailor-made training and individualized workshops
- You exploit the full potential of AM for your business by attending our training courses

Our training concept – geared to your needs

Our extensive seminar program offers various company divisions – such as production, management, and design – suitable training and workshop content. In every area, we make a distinction between the various levels: basic, advanced, and expert.

Individual courses tailored to your needs and workshops at your company are also possible. In each case, we impart firsthand practice-based knowledge.



	Design	Production	Management
Starter	AM Basic Training*	AM Basic Training*	Learning Expedition
Advanced	Design for Additive Manufacturing Training	Hands-on Training*	Management Deep Dive
	Hands-on Training*		
Expert	Bionic Design Training	Data Preparation Workshop	Strategy Workshop
	Bionic Design Expert Training	Powder Workshop	

*Based on metal or polymer AM technology

Customer-specific modification of training content possible



Your contact for all Academy-related issues

Get in touch with our experts to help you identify the potentials, the feasibility on a part-specific level, and the successful implementation of 3D printing in your company.
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AM BASIC TRAINING



DESIGN AND PRODUCTION

Our AM basic training course gives you a successful and quick start to 3D printing. We teach you how to identify the potentials of additive manufacturing and help you to discover applications in your company. You will learn which technologies are relevant to you from an independent standpoint. After the training course, you will be prepared to successfully start your journey into additive manufacturing.

Your benefits:

- Understand the trends that drive additive manufacturing
- Get a technology overview for polymer and metal AM and learn how to select the right technology
- Identify the potential of additive manufacturing in your business and learn how to identify the right parts
- Get to know the possibilities and restrictions in design and material usage
- Apply theoretical knowledge in practically oriented case studies

All requirements

Type of training:	Classroom training
Training level:	Starter
Target group:	Engineers, technicians, sales, purchasing, management
Requirements:	Basic engineering knowledge
Seminar size:	Max. 20 participants
Language:	English or German
Duration:	1 day
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises

The content

Unit 1: Introduction to Additive Manufacturing (AM)

- Explanation of the fundamental principles of AM processes
- Market trends and technology maturity level in different branches

Unit 2 + 3: Benchmark of Different AM Technologies

- Overview of market-relevant AM technologies for polymers and metals
- Comparison of different AM technologies by production speed, precision, part properties, etc.
- Illustration of typical industrial applications for each AM technology
- Exercise on technology selection

Unit 4 + 5: Applications of Additive Manufacturing

- Case studies of successful application of additive manufacturing in different industries
- Identification of additive manufacturing potentials in your company (practical)

Unit 6: Introduction to Design for Additive Manufacturing

- Rethinking the design approach for AM
- Basic design guidelines for AM
- Design to cost

Unit 7: Introduction to AM Material Properties

- Overview of AM materials (polymer and metals)
- Comparison of material characteristics from different AM technologies
- Introduction to raw materials (e.g., powder, filament, wire)

Unit 8: Cost Estimation

- Cost drivers in the additive manufacturing process chain
- Cost estimation for different technologies

Practical Unit 9–11: Part Selection and Redesign

- Methods and identification criteria to identify suitable parts
- Practical application of previously learned content to select a part based on a case study
- Redesign of a part according to previously taught design guidelines

DESIGN FOR ADDITIVE MANUFACTURING TRAINING



DESIGN

On this course, designers learn how to redesign parts for the Laser Beam Melting process (also called LBM) considering technology-specific design guidelines. In in-depth and hands-on sessions, participants learn how rethink parts for Laser Beam Melting efficiently. The training course imparts knowledge that will help you to minimize the cost of printing errors and significantly reduce the cost of parts.

All requirements

Type of training:	Classroom training
Training level:	Advanced
Requirements:	CAD design experience / basic engineering and design knowledge
Seminar size:	Max. 10 participants
Equipment:	Software in use
Language:	English or German
Duration:	2 days
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises

Your benefits:

- Learn how to successfully design for LBM
- Hands-on experience of the complete AM design workflow
- Fundamentals of the AM process to understand AM design thinking
- Practical design exercises using AM software solutions
- Introduction to AM software solutions possible

The content

Unit 1: Introduction to Laser Beam Melting (LBM) for Designers

- Basics of LBM process and machine setup
- Examples of qualified LBM parts

Unit 2: Material Properties for LBM

- Knowledge of main influencing factors regarding powder
- Overview of typical LBM materials
- Identification of the achievable physical and mechanical properties of LBM parts
- Dynamic fatigue behavior of LBM materials

Unit 3: Design for LBM

- Acquiring of skills necessary to design successfully for LBM
- Explanation of the design process and tools for LBM
- Illustration of design guidelines and restrictions for LBM

Unit 4: Cost Estimation and Design to Cost

- Definition of the relevant cost drivers for costs per part, like machine-hour rate, powder prices, manual preparations, etc.
- Illustration of a typical cost estimation for LBM parts
- Highlight cost-reduction potentials for LBM parts

Practical Unit 5: Data Preparation in Magics or Siemens AM Module

- Introduction to data preparation
- Apply theoretical knowledge on part orientation and support generation on sample parts

Practical Unit 6–9: Practical Case Studies

- Hands-on practice of design thinking for AM
- Optimization of a part's performance



HANDS-ON TRAINING



DESIGN AND PRODUCTION

Our hands-on training minimizes the cost of printing errors, because you can learn and practice directly on the machine. Ultimately, this helps you to optimize efficiency by ensuring that the part is correctly positioned on the machine. Our training courses take an interdisciplinary approach that combines the expertise of 3D printing specialists with software knowledge to make sure that you are optimally prepared.

Your benefits:

- Hands-on experience of the complete AM process chain
- Influence of process parameters on part quality and process stability
- Digital data preparation including part orientation, simulation, support structures, and nesting
- Machine preparation and operation
- Post-processing and quality assurance methods

The content

Unit 1: Laser Beam Melting

- Introduction to Laser Beam Melting (LBM) machine components
- Presentation of the principle of the LBM process, materials, and applications

Practical Unit 2–3: Material Properties and Powder Quality

- Obtainment of knowledge about crucial powder characteristics, how to measure them, and how they influence the LBM process
- Practical investigation of powder quality and effects on part quality
- Identification of the achievable physical and mechanical properties of LBM parts (static and fatigue)

Practical Unit 4–7: Digital Process Chain and Data Preparation

- Overview of different AM software solutions
- Part orientation, positioning of parts, generation of support structures, and placement on build platform
- Practicing the part's data preparation

Unit 8–9: Process Parameters

- Correlations between the machine components and the parameters and how they influence the quality of the parts
- Acknowledgement of techniques to increase productivity
- Practical exercise on the application of process parameters

Practical Unit 10–11: Process Simulation

- Introduction to process simulation
- Practical simulation of a part and interpretation of simulation results

Practical Unit 12–13: Machine Operation and IAPT Machinery Tour

- Overview of current machine concepts and required equipment
- Understanding of necessary steps for machine and build job preparation
- Hands-on live elaboration of consecutive AM machine preparation steps and settings
- Guided tour through IAPT

Unit 14: Quality Assurance

- Overview on quality assurance methods along the AM process chain
- Quality validation of critical powder and part characteristics

Unit 15: Post-processing

- Summary and comparison of all mechanical, chemical, and physical post-processing methods

Practical Unit 16: Machine Operation (2)

- Gain live experience of unpacking the build job including powder removal and platform extraction

Practical Unit 17: Post-processing

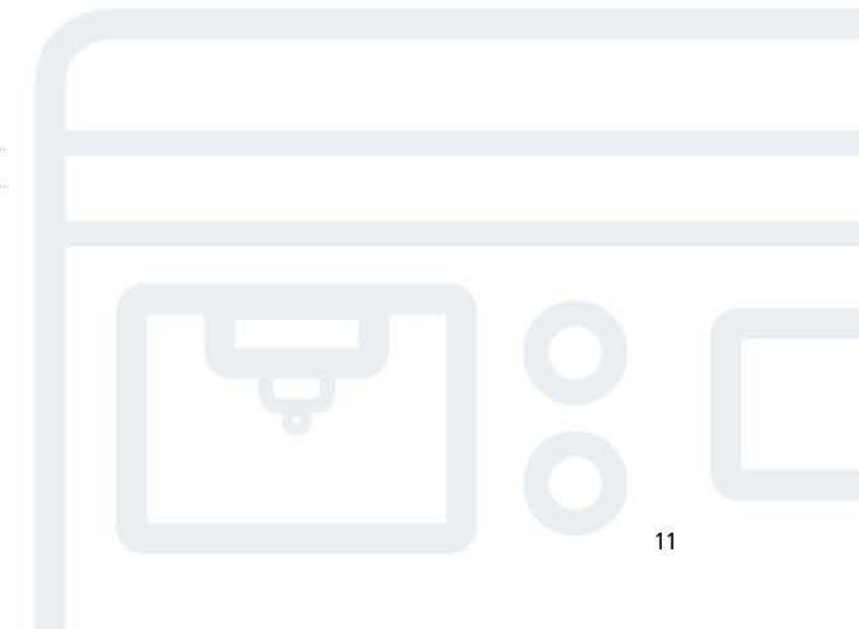
- Live handling of the post-processing steps including removal of the support structures and sandblasting

Practical Unit 18: Quality Assurance

- Demonstration of optical 3D scanning on the job
- Analysis and interpretation of AM part's microsections

All requirements

Type of training:	Classroom and hands-on training
Requirements:	Basic technical and engineering knowledge, participation in Basic Training recommended
Training level:	Advanced
Seminar size:	Max. 8 participants
Equipment:	Software and machines in use
Language:	English or German
Duration:	3 days
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT



BIONIC DESIGN TRAINING



DESIGN

The training addresses the end-to-end process chain to design bionic lightweight parts. On the course, participants learn how to set up a topology optimization and how to include bionic features in the design. Finally a producible bionic part is designed, prepared to build, and manufactured.

Your benefits:

- Learn how to successfully design for Laser Beam Melting (LBM) including bionic design features
- Fundamentals of the AM process to understand AM design thinking
- Introduction to AM software solutions and topology optimization
- Practical design exercises using AM software solutions
- Hands-on experience of the complete AM optimization workflow
- Digital data preparation including part orientation, support structures, and nesting
- LBM machine preparation and operation
- Post-processing and quality assurance methods

All requirements

Type of training:	Classroom and hands-on training
Training level:	Advanced
Requirements:	Basic engineering knowledge, CAD experience recommended
Seminar size:	Max. 8 participants
Equipment:	Software and machines in use
Language:	English or German
Duration:	4 days
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT

The content

Unit 1 and 2: Theory of Optimization and Introduction to Altair's Inspire Software

- Introduction to the basics of optimization
- Introduction to the software interface

Practical Units 3–5: Set Up Topology Optimization and Structural Interpretation

- Setting up the part considering the given design constraints
- Perform topology optimization
- Structural interpretation of workshop part

Unit 6: Material Properties for Laser Beam Melting (LBM)

- Explanation of the static and fatigue properties of LBM
- Description of the achievable surface roughness and accuracy of LBM

Unit 7: Design for LBM

- All relevant design guidelines for LBM
- Learn from best-practice examples

Unit 8-10: Bionic Design of Individually Optimized Parts (Theory and Practical)

- Overview on bionic design principles and bionic methodology
- Introduction to the design capabilities of Inspire
- Change of workshop parts considering design rules

Unit 11 and 12: Digital Process Chain and Data Preparation in Magics (Theory and Practical)

- Overview on the digital process chain and relevant software solution
- Introduction to data preparation software

Practical Unit 13: Finalization of Bionic Design for Printing

- Design changes to improve the part cost performance
- Setting of supports and print preparation of the workshop part

Unit 14 and 15: LBM Machine Operation and Tour through Fraunhofer IAPT Machinery (Theory and Practical)

- Introduction to required equipment and machine workflow for LBM
- Live demonstration of machine set-up and starting of workshop build job
- Guided tour through Fraunhofer IAPT machinery

Unit 16: Cost Estimation and Design to Cost for LBM

- Definition of most relevant cost driver and a cost-estimation framework
- Highlight cost-reduction potentials and cost-development trends for LBM parts

Unit 17: Application of AM in Different Industries

- Best-practice cases of how to use AM capacities for increasing performance of final products
- Explanation of how to identify new business opportunities due to AM

Unit 18–22: Post-processing and Quality Assurance (Theory and Practical)

- Introduction of quality assurance and post-processing methods
- Quality validation of critical powder and part characteristics
- Live handling of workshop part including machine handling, support removal, and peening
- Live demonstration of optical 3D scanning and AM part's microsections

BIONIC DESIGN EXPERT TRAINING



DESIGN

On this course, leading experts teach you how to design manufacturable bionic structures. You learn how to use state-of-the-art software tools to get high-performance parts in terms of weight, cost, and quality. By applying the best practices from Fraunhofer IAPT you will soon be able to create superior part designs.

Your benefits:

- 25% of part costs saved through optimization for 3D printing
- Basics of design for additive manufacturing with Laser Beam Melting
- Basics of material properties (dynamic and static)
- Construction of AM-ready parts in practical exercises
- Basics of part preparation and support structure design
- Avoiding support structures and defining orientation directions

All requirements

Type of training:	Classroom training
Training level:	Expert
Requirements:	Basic understanding of AM; Experience in working with remodeling software, like 3DEXP Imagine and Shape, 3DEXP Functional Generative Design (GDE), Altair Inspire, and Siemens Realize Shape
Seminar size:	Max. 10 participants
Language:	English or German
Duration:	3 days
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises

The content

Unit 1: Design Guidelines

- Summary of design guidelines
- Explanation of the relation between design guidelines and AM process
- Identification of optimization potential of example parts according to design guidelines
- Decide to use or not to use automatic overhang generation

Unit 2: Material Properties

- Overview of LBM materials
- Comparison of material properties
- Purpose of use of common LBM materials
- Selection of suitable materials for example parts

Unit 3: Bionic Feature Principle and Workflow

- Basics of biomimicry
- Explanation of how to find bionic solutions
- Examples of successful bionic designs
- Explanation of bionic features available in the catalogue concerning to function, purpose of use, pros and cons

Unit 4: Orientation and Support

- Explanation of the importance of suitable orientation and support for LBM parts
- Impact of orientation on manufacturability, manufacturing time, costs, and different part properties
- Overview of supports and their use
- Explanation of the guidelines for design of supports and the reasons to use supports in relation to the LBM process
- Impact of supports on post-processing, material consumption, and costs
- Selection of orientation and support for sample parts

Practical Unit 5: Data Preparation

- Apply theoretical knowledge on part orientation and support generation on sample parts

Practical Unit 6: Bionic Design for AM

- Selection of a provided topology optimization result for the redesign
- Selection of part orientation
- Redesign of the part using 3D Experience Functional Generative Design (GDE)
- Addition of standard supports using Materialise Magics as preparation for the process simulation

Unit 7: Process Simulation

- Overview of process simulation software
- Explanation of process simulation challenges
- Show how to run a process simulation
- Interpretation of process simulation results
- Simulation of attendees' redesign by IAPT employees to provide the results for interpretation

Practical Unit 8: Interpretation of Simulation Results

- Interpretation of provided process simulation results
- Derivation of optimization potential

Practical Unit 9: Design Optimization

- Finishing the redesign of the part in an iterative design change process taking into account the design guidelines and the topology optimization results

Practical Unit 10: Design for Manufacturing

- Design guidelines for post-processing challenges
- Part adjustment according to design guidelines for post-processing

Unit 11: Bionic Support Design

- Addition of suitable bionic supports, like tree supports, to decrease part costs

DESIGN WORKSHOP*



DESIGN

Additive manufacturing makes it possible to create new, disruptive part designs with new features and improved functionality. A business case can often only be presented once the new freedoms afforded by the technology are consistently used. A redesign concept is needed in order to be able to work out a resilient business case. The aim of the workshop is to get together with our experts to create a redesign concept that fully exploits the new opportunities presented by 3D printing. To think outside of the box in a creative atmosphere under structured guidance.

Your benefits:

- Bring your own AM project
- Qualify your designers via an on-the-job workshop
- Getting direct support from our AM design experts for the benefit of your actual projects
- Assessment of technological feasibility of your part by our design experts

All requirements

Type of training:	Classroom training
Training level:	Expert
Requirements:	Understanding of design for the AM and AM process chain
Seminar size:	Max. 8 participants
Language:	English or German
Duration:	1 day
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises

* Customer-specific modification of Training possible.
Based on metal or polymer AM-Technology.

The content

Individually tailored to the customer

- Direct benefits for current projects and problems
- Learning on the job for your employees
- Benefit from the experience of leading design specialists at Fraunhofer IAPT
- All from one provider, including the identification of suitable parts, qualification projects, redesigns at Fraunhofer IAPT, and the manufacture of parts

or

- Creating redesign concepts
- Working out the cost-cutting potential resulting from a redesign
- Assessing the technical feasibility
- Determining qualification and post-processing measures



DATA PREPARATION WORKSHOP



PRODUCTION

Well-practiced data preparation cuts costs caused by printing errors and follow-up work. The combination of supporting structures, the packaging of parts, and the right positioning of the parts can all be critical to the economic viability of a business case. Prepare your parts under the supervision of our specialists and benefit from their expertise to ensure that your printing is a success.

Your benefits:

- Bring your own parts from current projects and enjoy direct benefits or solve problems immediately
- Cut costs thanks to fewer printing errors, lower process costs, and less post-processing
- Benefit from our expertise gained from various implementation and consulting projects with major customers from the industry
- Learning on the job for your employees

The content

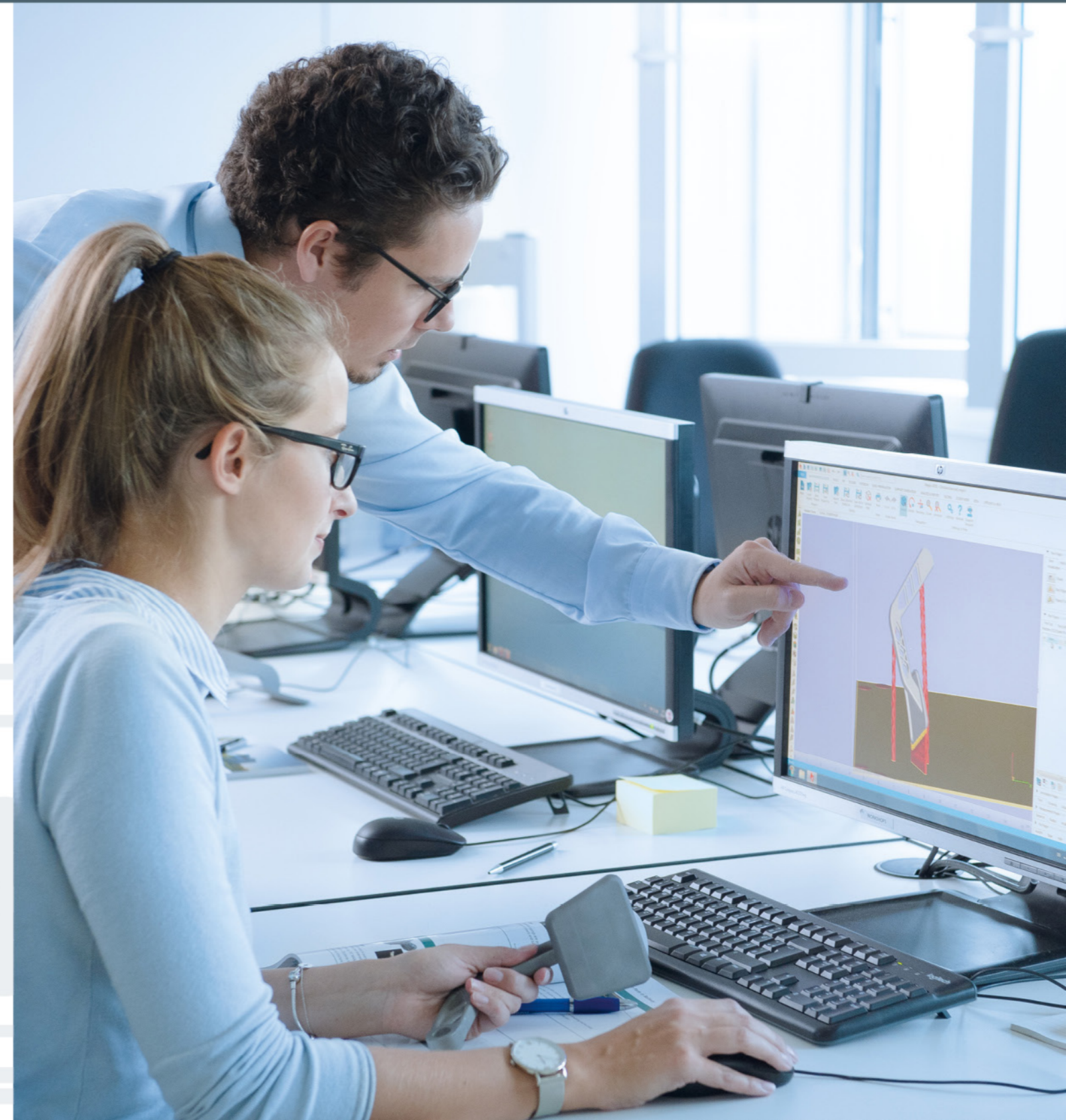
Unit 1: Introduction to Data Preparation

Unit 2: Screening and Analysis of Parts

Unit 3: Preparation of Individual Parts

All requirements

Type of training:	Classroom training
Training level:	Expert
Requirements:	Basic and Hands-on Training
Seminar size:	Max. 8 participants
Equipment:	Software in use, machines in use if defined
Language:	English or German
Duration:	1 day
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises if IT infrastructures are adequate



POWDER WORKSHOP



PRODUCTION

In this compact workshop, leading-edge practitioners and scientists teach you the complex topic of powder quality. You learn how to treat and test powder in order to assure high-quality additive manufacturing parts. The goal of the course is to accelerate the implementation of a powder quality routine and to improve your powder qualification process.

All requirements

Type of training:	Classroom training
Training level:	Expert
Requirements:	Basic understanding of mechanics and physics, understanding of the LBM process
Seminar size:	Max. 8 participants
Language:	English or German
Duration:	2 days
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises

The content

Unit 1: Powder Production

- Explanation of the fundamental principle of established powder production methods
- Overview of advantages and disadvantages of the presented production methods
- Illustration of typical powder morphologies for each method

Unit 2: Powder Characteristics

- Presentation of the most relevant powder characteristics
- Overview of powder measurement methods and the required standards

Unit 3: Powder Specification

- Giving an overview of powder specification
- Demonstration of powder certificates and the main quality facts

Unit 4: Powder Quality and Handling

- Explanation of the powder process chain
- Illustration of powder mixing methods for new and reused powder
- Acquiring of general powder handling skills
- Introduction in safety aspects and powder FMEA



LEARNING EXPEDITION



MANAGEMENT

The additive manufacturing Learning Expedition gives decision makers an interactive entry point into the world of additive manufacturing. The participants on this training course will see the entire process chain up-close – from the design stage to the actual manufacturing processes and final quality assurance – all taught through a balanced mix of basic theoretical knowledge and hands-on use of software and hardware. The aim of the training course is to highlight the potential of additive manufacturing as well as the technological limitations. Course participants will be given the skills to identify strategic development opportunities and new business areas within their company and anticipate the possible impact on their business model.

Your benefits:

- A supervised start in a new business area
- A compact introduction to industrial AM implementation
- Economic feasibility analysis of AM parts
- Identification of business cases along the entire value chain

The content

Unit 1: Additive manufacturing (AM) Market

- Market overview and outlook
- Identify the technological readiness level of your industry

Practical Unit 2: AM Potential

- Potentials of AM technology concerning product improvements and process optimization

Unit 3: AM Process

- Benchmarking of different AM technologies
- Choose the most suitable AM technology for your individual application

Practical Unit 4: AM Design

- Hands-on practice of design thinking for Laser Beam Melting (LBM)

Practical Unit 5: AM Data Preparation

- Part orientation, positioning of parts, generation of support structures
- Print your part right the first time in LBM

Practical Unit 6: AM Machine Operation

- Overview of current LBM machine concepts
- Hands-on demonstration of the LBM machine start procedure

Unit 7: AM Post-processing and Quality Assurance

- Overview of relevant QA technologies
- Overview of relevant post-processing methods

Practical Unit 8: AM Business

- Illustration of a typical cost estimation for LBM parts
- Design to value to decrease life-cycle costs of your product

Practical Unit 9: AM Implementation Strategies

- Change management to successfully implement AM in your business

Unit 10: Digitalization and Industrialization

All requirements

Type of training:	Interactive classroom workshop
Training level:	Starter
Requirements:	Basic engineering knowledge
Seminar size:	Max. 8 participants
Equipment in use:	Design software and AM machine
Language:	English or German
Duration:	2 days
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT



MANAGEMENT DEEP DIVE WORKSHOP



MANAGEMENT

This training course is aimed at decision makers in the area of additive manufacturing who wish to gain a compact yet deeper insight into the technology. The aim of the Management Deep Dive Workshop is to work out business cases for additive manufacturing and raise awareness of the challenges relating to change management. Our experts use their in-depth knowledge to highlight and assess areas of activity, possible applications, and future developments.

Your benefits:

- Increase efficiency of your implementation process by obtaining in-depth technology and market knowledge
- Fast start into a new business field
- Become an innovator and gain a relevant competitive advantage

All requirements

Type of training:	Interactive classroom workshop
Training level:	Advanced
Requirements:	Basic engineering knowledge
Seminar size:	Max. 8 participants
Equipment in use:	Design software and AM machine
Language:	English or German
Duration:	1 day
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises

The content

Unit 1: Introduction and Benchmark of Metal Additive Manufacturing Technologies

Unit 2: Laser Beam Melting Technology and Market Overview

Unit 3: Digital Process Chain and Design Process

Practical Unit 4: Live Demonstration of LBM Process Chain

Unit 5: Laser Beam Melting Supply Chain

Practical Unit 6: Laser Beam Melting Supply Chain

Unit 7: Additive manufacturing Applications

Unit 8: Cost Driver and Business Case Development



STRATEGY WORKSHOP



MANAGEMENT

Tailored to your needs, you will be assisted by our experts to work out strategic matters relating to additive manufacturing and develop a profound plan to implement AM in your business.

Your benefits:

- Benefit from the supervised start in a new business area
- Take advantage of our expertise gained from various implementation and consulting projects with globally leading companies
- Transfer the lessons learned from additive manufacturing success stories to your own plans
- Become an innovator and gain a relevant competitive edge

All requirements

Type of training:	Interactive workshop
Training level:	Expert
Requirements:	Knowledge of additive manufacturing technology, process chain and market / Deep Dive Management Training recommended
Seminar size:	Max. 10 participants
Language:	English or German
Duration:	Depending on your requirements
Training date:	To be defined on demand
Venue:	At Fraunhofer IAPT or on your premises

The content

- Unit 1: Work out Implementation Aims and an Implementation Strategy
- Unit 2: Market Entry Strategies
- Unit 3: SWOT Analysis: Additive manufacturing at your Company
- Unit 4: Make-or-Buy Analysis
- Unit 5: Create an Implementation Roadmap
- Unit 6: Draw Up a Change Strategy
- Unit 7: Your own Content



PART FEASIBILITY SCREENING / DESIGN CHALLENGE



IMPLEMENTATION

The advantages of additive manufacturing are clear: functional, lightweight designs and the integration of parts ultimately lead to improved products. The task now is to identify and exploit the potential of your products.

Part Feasibility Screening

We enable your employees to identify the diamonds in your portfolio. With the help of our training courses or compact part screening workshops, we give you all the necessary tools for finding suitable parts for additive manufacturing. We then get together to examine the identified parts. With the assistance of our experts, we evaluate the technical and economic feasibility of the parts in detail.

Design Challenge

Take a great leap forward in implementing AM in your company successfully by starting an additive manufacturing competition.

The Design Challenge involves employees searching for parts for a certain period of time in the course of their daily work. Our employees oversee this process and subsequently analyze the results. Finally, awards are presented for the best parts with the biggest AM potential.

A Design Challenge motivates employees to think about AM. It is also an opportunity to identify lucrative applications for additive manufacturing within the shortest space of time.

Learning and Understanding

Acceptance and Motivation

Economic Benefit

Do you have any questions concerning the content of the training courses? Please do not hesitate to contact us:

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Editorial notes

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