Qualification goals

Master's Degree Programme

Applied AI for Digital Production Management

Faculty of Applied Natural Sciences and Industrial Engineering at Deggendorf Institute of Technology

Created by:

Dr. Sunil Survaiya, Programme director of the master's degree programme Applied AI for Digital Production Management

Bachelor of Arts, Nina Weidner, Faculty Applied Natural Sciences and Industrial Engineering (NuW)

Gender neutrality

The use of double forms or other designations of female, male and other genders has been largely avoided in order to maintain legibility and clarity. All designations given to the various groups of university staff apply equally to all genders of the relevant groups.

as of 17/02/2025

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1 Objectives of the degree programme

The consecutive, practice-oriented master's degree programme Applied AI for Digital Production Management (MDM) is designed to enable graduates of *Diplom* or bachelor's degree programmes in Industrial Engineering, Production Engineering, Mechatronics, or related fields to deepen the knowledge they have acquired to date with subject-specific expertise. In doing so, they develop the ability to address complex tasks and gain practical experience through case studies, thereby equipping themselves to meet the demands of industrial technologies effectively.

The programme builds on a bachelor's or *Diplom* degree by deepening prior knowledge while also expanding the overall knowledge base. Graduates are equipped with the industrial and technical expertise required to work in an application-oriented manner and to prepare for roles in industrial development departments. Particularly well-qualified students also acquire the theoretical foundations necessary for work in research-related areas of industry.

2 Learning outcomes of the programme

The programme comprises three semesters and concludes with an independent academic thesis (master's thesis).
The master's programme is structured in modules and consists of three semesters in total. Students earn 90 ECTS credits in total.

The learning outcomes of the individual modules, including their detailed objectives, as well as the knowledge, skills, and competences to be acquired by graduates, are set out in the module handbook for the master's programme Applied AI for Digital Production Management at DIT. The module handbook lists the modules in accordance with the module numbers specified in the study and examination regulations.

3 Programme outcomes and qualification goals

Professional and methodological skills

The internationally oriented master's programme enables bachelor's graduates in industrial engineering, production engineering, mechatronics, and other related fields to deepen their knowledge and understanding of the management of digital production systems used in industrial processes. The contents on machine learning and deep learning (MLDL) provide the fundamental basis for various algorithms and models through a mathematical approach. The field of computer vision has developed rapidly within the manufacturing industry in the wake of Industry 4.0. The course is designed to provide students with a platform for understanding basic concepts, leading to the practical implementation of applications (via a group mini-project). These practical experiences strengthen students' abilities in conceptual applications, AI algorithms, and programming. The module Advanced Intelligent Systems focuses on developing and implementing big data systems, including the use of large datasets for deep learning models and concepts of natural language processing (NLP). By linking teaching content in machine learning, data analysis and management, and intelligent systems, the programme provides expertise in innovative methods of data and information processing. Students also acquire subject-specific knowledge in production and logistics. Globalisation has created the need for organisational and interpersonal skills in international projects to ensure their success. The course Cross-Cultural Development for Engineers offers students the opportunity to thrive in this challenging environment by leveraging diversity, overcoming language barriers, improving understanding, building relationships, and resolving conflicts.
Further core components of the curriculum include quality assurance and sustainability in the digital production chain.

Students acquire the necessary knowledge, skills, and methods to apply scientific findings and procedures independently in industry and the service sector.

They also gain fundamental expertise in concepts, results, and methods in line with the current state of research, enabling them to familiarise themselves with technological advances independently. The degree programme aims to qualify students for scientifically based engineering activities in fields such as:

- development, design, and application of complex digital production systems, e.g. in the areas of:
  - Digitalised production control

- Information management to increase material and energy efficiency
- Near real-time exchange of information, including across production facilities
- Ergonomic visualisation of production data

- Management and leadership of technical projects
- Production, assembly, commissioning, and service management
- Quality management and assurance
- Industrial engineering
- Technology management
- Research and teaching.

The programme is designed to offer a broad-ranging, research-informed, and interdisciplinary education that prepares graduates for diverse professional roles. Career opportunities arise not only in commercial and supply enterprises, but also in research and teaching, as well as in independent practice.

Through the master's thesis and master's seminar, students demonstrate their ability to apply the knowledge and skills acquired during their studies to complex tasks independently, and to present their findings appropriately in written and oral form. In doing so, they provide evidence of their competence in independent academic work.

The knowledge gained forms the foundation for further study, including doctoral research in production engineering or a related field.

Social and personal skills

The master's programme Applied AI for Digital Production Management fosters social competence as well as communication and presentation skills. wing to its strong practical orientation, students are well prepared upon entering professional life to engage in both corporate and academic environments. In addition to technical expertise and methodological knowledge, the programme also imparts management techniques and social competences.

Through case studies in three modules, students strengthen not only their subject-specific but also their personal and social skills. Case studies provide an ideal opportunity to apply the knowledge gained in the respective modules in practice. Working in small teams, students address specific scenarios. In these scenarios different approaches and perspectives are discussed in order to arrive at a practice-oriented solution. Decision-making skills are also trained in this process. Furthermore, case studies enable students to examine problems from multiple viewpoints. Theoretical knowledge is linked to the analyses developed to understand and explain each scenario. Case studies also provide excellent preparation for future working life

through teamwork. A group presentation of results forms part of the case study.

Graduates of the Applied AI for Digital Production Management programme are able to present their work in a structured manner and to discuss it with an expert audience. Moreover, graduates are equipped to organise themselves effectively and to demonstrate teamwork skills in interdisciplinary collaboration.

4 Learning outcomes of modules / module objectives / objectives matrix

Individual modules, their detailed objectives and skills to be acquired by graduates are described in the module handbooks for the master's degree programme.

The following table shows the relationship between individual modules and the objectives described in the previous section for the master's programme.

Objectives matrix of the modules in the master's degree "Applied AI for Digital Production Management"

Module	Objectives											
	Knowledge				Skills				Competencies			
	Scientific and technical basics	Engineering methodology	Engineering practice and product	Interdisciplinary	Scientific and technical basics	Engineering methodology	Engineering practice and product	Interdisciplinary	Scientific and technical basics	Engineering methodology	Engineering practice and product	Interdisciplinary
Module MDM-01 Machine Learning and Deep Learning in Production and Logistic	x	x	xx		x	x	xx		x	x	xx	
Module MDM-02 Advanced Statistical Methods & Optimization	x	xx	x		x	xx	x		x	xx	x	
Module MDM-03 Data Management		x	xx			x	xx			x	xx	
Module MDM-04 Production and Logistic Management			xx				xx	xx			xx	
Module MDM-05 Digital Tools in Development and Production		xx	xx			xx	xx			xx	xx	
Module MDM-06 Machine Vision			xx	xx			xx	xx		xx	xx	xx
Module MDM-07 Cross-Cultural Development for Engineers			x	xx			x	xx			x	xx
Module MDM-08 Advanced Intelligent Systems		xx	xx			xx	xx			xx	xx	
Module MDM-09 Case Study Intelligent Systems in Production			xx	xx			xx	xx			xx	xx
Module MDM-10 Digital Production Systems		xx	xx			xx	xx			xx	xx	
Module MDM-11 Case Study Production Systems			xx	xx			xx	xx			xx	xx
Module MDM-12 Subject-specific compulsory elective		x	xx	x		x	xx	x		x	xx	x

(FWP)												
Module MDM-13 Quality and Sustainability	x	xx	xx		x	xx	xx		x	xx	xx	
Interdisciplinary area												
Module MDM-14 Master's Module			xx	xx			xx	xx			xx	xx

Legend: xx strong relation; x medium relation