# Micro-Degree Programs
# Offered in the Study Quarter 1/10/25 - 31/12/25

## What are Micro-Degree programs?

In addition to the full degree programs offered by the German University of Digital Science, the individual teaching modules of the various study programs are also offered separately or in thematically bundled blocks as interactive online Micro Degree Programs.

These 3-month programs are designed for lifelong learning and professional development, providing learners with valuable knowledge and skills. Learners who wish to up-skill, re-skill, or further their education on a specific digitization topic can enroll in Micro Degree Programs and earn a Micro Degree worth 5 credits (ECTS). One of the main advantages of a Micro Degree is that it can be recognized by any university for a full degree program.

**Registration Link:** https://campus.german-uds.de/micro-degree-programs

## 1. Immersive Technologies

### Program Overview

This module aims to provide a comprehensive understanding of how immersive technologies create engaging and interactive experiences by blending the digital and physical worlds.

### Program Outcomes

Students gain the technical aspects of developing immersive content including 3D modelling, real-time rendering, and user interaction.

### Learning Objectives

- Grasp the core principles and ecosystems of immersive technologies, including their hardware and software.
- Acquire technical skills for designing user-centered immersive experiences, encompassing 3D modeling, animation, real-time rendering, and interface design.
- Evaluate the use of immersive technologies across industries to understand their impact, benefits, and challenges.

**Module Instructor:** Prof. Dr. Daniele Di Mitri

## 2. Big Data, Software Systems, Cloud Computing

**Program Overview**

Big data and cloud computing are leading edge IT technologies that team together as key enablers for today's IT industry with its emerging AI-based solutions.

**Program Outcomes**

Students learn about the basics and advanced topics of big data, complex software systems, platforms, and cloud computing, their design and implementation, and their utilization in commercial applications.

**Learning Objectives**

- Understand the fundamentals, principles, and tools of big data and cloud computing, including distributed data processing and relevant APIs.
- Analyze the role of cloud providers, evaluate cloud-based architectures, and assess their business impact.
- Develop innovative AI and data processing solutions for the next generation.

**Module Instructor:** Prof. Dr. Raad Bin Tareaf

## 3. Complex Problem Solving

**Program Overview**

This course addresses the multifaceted challenges of digitalization and digital transformation across various sectors. It emphasizes the importance of understanding and managing the interrelated elements inherent in these complex issues.

**Program Outcomes**

The skill to solve complex problems belongs to a set of so-called "future skills", which are needed to thrive in and design the digital age.

**Learning Objectives**

- Develop theoretical, methodological, and problem-solving skills to address complex issues.

- Practice teamwork, including conflict management, while enhancing cognitive, emotional, and social abilities.
- Present complex problems and solutions effectively to an audience, incorporating feedback and critique.

**Module Instructor:** Dr. Maurice Steinhoff

## 4. Cybersecurity Fundamentals

**Program Overview**

This course equips participants with essential knowledge and skills to navigate the rapidly evolving field of cybersecurity. It provides a foundational understanding of key concepts such as the CIA triad common threats, and attack vectors

**Program Outcomes**

Empowers students to understand and navigate the complexities of today's cyber threat environment, preparing them to implement effective security strategies and contribute to the resilience of organizations

**Learning Objectives**

- Gain theoretical and methodological knowledge in cybersecurity while reinforcing IT fundamentals, including networking, operating systems, and software with a cybersecurity focus.
- Understand key security issues, attack categories, the cyber kill chain, and principles and technologies of modern cybersecurity.
- Explore current practices, emerging challenges, and research trends in the field of cybersecurity.

**Module Instructor:** Dr. Pejman Najaf

## 5. Logic and Symbolic AI

**Program Overview**

This Course is an introduction to symbolic AI. First the basics of logic systems are discussed, followed by the presentation of combinatorial algorithms for the solution of AI problems. Prolog is used as the implementation language.

**Program Outcomes**

Students learn to prove assertions of predicate logic and implement simple proof systems in Prolog.

**Learning Objectives**

- Learn logic, proof systems, and combinatorial algorithms, and apply them to solve symbolic problems.
- Develop programming skills for symbolic AI systems and practice teamwork on benchmark problems.
- Master various proof methods for tackling symbolic challenges effectively.

**Module Instructor:** Dr. Felix Weitkämper

## 6. Understanding and Designing the Digital World

**Program Overview**

This course provides an advanced understanding of digital technologies and focuses on digital media, and the fundamentals of the Internet, the WWW, and emerging digital technologies.

**Program Outcomes**

Students learn about applying digital capabilities to processes, products, and enhance customer value, and create new revenue opportunities.

**Learning Objectives**

- Provide students with advanced understanding and design capabilities of digital technologies.
- Be prepared to assess the potentials of and be able to apply digital technologies in companies as well as in public institutions.

**Module Instructor:** Profs. Drs. Christoph Meinel and Mike Friedrichsen

## 7. Coding Camp I: Python


**Program Overview**

The course provides a deep dive into software development. Software is a crucial component of every modern device and plays an essential role.

**Program Outcomes**

To better understand the process behind software development, the coding camp places students into a team software development project in which they get to understand and experience it.

**Learning Objectives**

- Students are aware of and can explain different models of software development, such as agile as well as traditional development principles.
- Students experience working and developing code for a project in a (small) team.
- Students have developed and experienced the lifecycle of a software development project. **Module Instructor:** Dr. Thomas Staubitz

## 8. Design Thinking


**Program Overview**

The Design Thinking process combines methods and tools from the fields of design, engineering, the social sciences, and business administration. IT is a team-based approach and uses these tools to determine the latent desires and

**Program Outcomes**

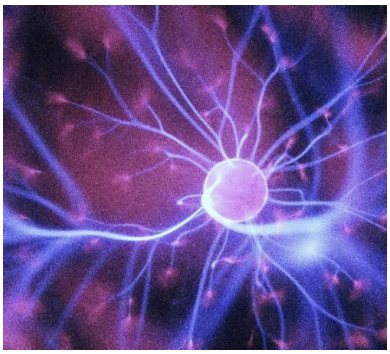
By focusing on user needs and preferences, the course ensures that solutions are desirable and effectively address real -world problems.

**Learning Objectives**

- Acquire subject-specific theoretical and methodological knowledge.
- Explore, understand and apply the methods and mindsets of Design Thinking.
- Practice techniques using concrete project challenges and learn how to effectively and productively contribute to a collaborative team.

**Module Instructor**: Dr. Steven Ney

## 9. Machine Learning & Analytics



**Program Overview**

Decision-making is empowered by (big) data through the use of machine learning and data analytics principles.

**Program Outcomes**

In the course, students will compare different theoretical approaches to AI and be able to choose the best problemsolving strategy for a given application.

**Learning Objectives**

- Students understand the fundamental goals of machine learning and data analytics.
- Provide students with an advanced understanding of the mathematics and technology behind AI models.
- They become proficient in the application of methods of data science, machine learning, and data analytics.

**Module Instructor** : Prof. Dr. Felix Weitkämper

## 10. Digital Age Leadership and Innovation Management

**Program Overview**

The module focuses on advanced theoretical as well as practical frameworks and methods for leadership in the digital world as well as the required change management tools to achieve digital transformation within an organization.

**Program Outcomes**

The advancements of digital technologies put companies across industries under pressure to digitize their internal processes, focus on new ways of customer value creation and develop and implement new business models.

**Learning Objectives**

- Provide students with an understanding of advanced concepts of leadership and change management in the digital age.
- have in-depth knowledge of the change management process.
- apply leadership theories and change management concepts in practice, e.g. in companies of various industries or public institutions.

**Module Instructor**: Dr. Georg Loscher

## 11. Applications of AI

**Program Overview**

This course provides the students with hands on experience solving a complex, yet limited problem in its scope. Instead of recognizing faces or fingerprints in an open population, the problem is solved for a limited population of individuals (100, for example).

**Program Outcomes**

The complete solution pipeline is developed, from data capture to data set generation and application of AI libraries in the cloud.

**Learning Objectives**

- Students select one among a set of AI problems and work during the quarter solving it.
- The participants learn how to create a data set or leverage existing data sets for the AI problem at hand.
- Examples of problems that could be addressed in this course are face recognition, fingerprint recognition, pedestrian recognition, speech recognition for a limited vocabulary, etc.

**Module Instructor**: Dr. Raad Bin Tareef

## 12. Transformation Public Service


**Program Overview**

While private organizations often have more tangible drivers – growth, profit, market share – to push their digital transformation, governments and public services also need to transform because of their purpose.

**Program Outcomes**

Public services need to be accessible to everyone while ensuring data security and privacy. Public digital literacy or ownership of public data are additional aspects to consider when addressing this topic.

**Learning Objectives**

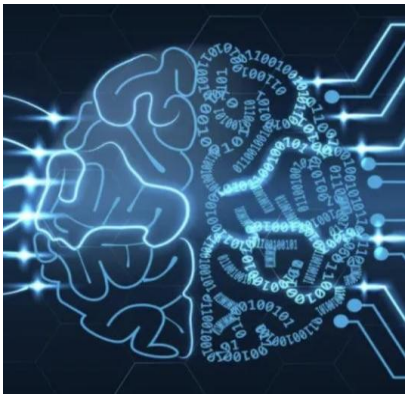
- Understand aims, structure and working of public services in different countries.
- Understand and be able to explain the impact of digital technologies and digitization on public services.
- Understand, critically assess and develop solution scenarios to diverse challenges in digitization of public service.

**Module Instructor**: Dr. Lorenzo Garcilazo

## 13. Deep Learning

**Program Overview**

Most advanced AI applications being developed and deployed today rely on one or more "deep learning" models. In this course, students will learn to construct deep neural networks, with or without attentional components.



**Program Outcomes**

Students will train preconfigured networks using AI libraries and deploy them in the cloud. In the second part of the course, students will learn how to train ML models using reinforcement learning.

**Learning Objectives**

- Be able to understand how modern image and speech recognition systems work.
- Be able to train different types of sub-symbolic models.
- Modify complex networks based on pipelines or transformers.

**Module Instructor**: Dr. Haojin Yang

## 14. Information Security Management

**Program Overview**

The goal of cybersecurity is to identify cyber risks and reduce them to an acceptable level. From a strategic view, an organization's cyber-security program and cyber risk management must fulfill five core functions.

**Program Outcomes**

The module provides students with an over-view and understanding of the principles of information security management that are commonly used in industry.

**Learning Objectives**

- Students understand key themes and principles of in-formation security management.
- Students learn relevant knowledge on governance and security policy, legal and compliance, Security awareness and security implementation considerations, security standards and checklists.
- Students practice common methods for risk management, threat and vulnerability analysis, critical infrastructure security, information leakage detection and prevention, incident response, disaster recovery, etc.

**Module Instructor**: Dr. Tim Stuchtey

## 15. Haptics and Multisensory Integration

**Program Overview**

This module delves into the principles and applications of sensory interactions and haptic feedback in creating immersive experiences. This course explores the physiological and psychological foundations of how humans perceive and integrate multiple sensory inputs, with a focus on touch (haptics).

**Program Outcomes**

Students will learn about the design and implementation of haptic systems, as well as the broader implications of multisensory integration in virtual reality (VR), augmented reality (AR), and other interactive technologies.

**Learning Objectives**

- Understand the fundamental principles of haptic technology and multisensory integration.
- Develop skills in designing and implementing haptic feedback systems and multisensory experiences, focusing on enhancing user interaction and immersion in digital environments.
- Analyze and evaluate the impact of haptics and multisensory integration on user experience, identifying best practices for various applications in VR, AR, and other interactive technologies.

**Module Instructor**: Dr. Daniele Di Mitri

## 16. Software Application security


**Program Overview**

Software systems and web applications are being used in more and more scenarios. As a result, these systems are becoming more complex, and the security of these software systems is becoming increasingly important.

**Program Outcomes**

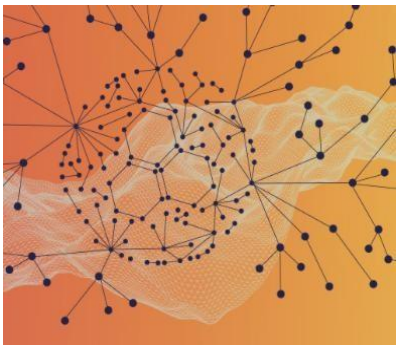
This module focuses on methods and approaches for developing secure applications (e.g. secure coding and security by design). It also looks at different security measures for web applications, applications for smartphones /tablets and traditional applications.

**Learning Objectives**

- Students understand the challenges of developing se-cure and highly complex software systems.
- Students know common security measures and concepts for different categories of applications.
- Students know possible analysis methods for identifying and analysing vulnerabilities and attack possibilities and can use them accordingly.

**Module Instructor**: Dr. Pejman Najafi

## 17. Digital Ecosystem & Platform economy



**Program Overview**

This module explores the transformative impact of digital ecosystems and platforms on the contemporary business landscape. Students will examine how these interconnected systems create value, reshape market dynamics, and challenge traditional business models.

**Program Outcomes**

Students will gain a comprehensive economic understanding of digital ecosystems and platforms, equipping them with the skills to navigate and leverage these modern business frameworks effectively.

**Learning Objectives**

- Analyze the characteristics, opportunities, and challenges of digital ecosystems and platforms.
- Understand how digital ecosystems and platforms create value for stakeholders and how to assess their economic significance.
- Develop strategic insights for launching and managing successful digital platforms.

**Module Instructor**: Dr. Marco Bade

## 18. Entrepreneurial Finance & Innovation

**Program Overview**

This module delves into the intersection of entrepreneurship, finance, and innovation, exploring how funding mechanisms and financial strategies are integral to the growth and success of innovative start-ups. Students will learn about the unique challenges and opportunities faced by entrepreneurial ventures in securing funding, and how these financial decisions influence their innovation trajectories. **Program Outcomes**

Students will develop a robust understanding of the entrepreneurial finance landscape, enabling them to effectively navigate funding options, assess investor motivations, and implement strategic financial decisions to foster innovation and growth in start-ups.

**Learning Objectives**

- Analyze the unique characteristics of entrepreneurial ventures compared to traditional businesses.
- Evaluate the various funding sources available to start-ups, including their advantages and limitations.
- Develop skills for assessing and negotiating contracts with investors, including cash flow rights, control rights, and corporate governance.

**Module Instructor**: Dr. Marco Bade

## General Information

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|---|---|
| **Course Start Date**<br>1st April 2025, 1st Oct 2025 | **Course End Date**<br>30th June 2025, 31st Dec 2025 |
| **Fees**<br>∈900 for the full course | **Teaching Format**<br>Mastery: Coding |
| **Total Workload Master's**<br>125h (40h/85h) / 5 ECTS | **Total Workload MBA**<br>100h (30h/70h) / 4 ECTS |
| **Micro Degree**<br>125h (40h/85h) / 5 ECTS | **Offered**<br>Odd Quarters |

**Examinations**

Quizzes, presentation(s), essay(s)/paper(s), project report(s), written exam.