

# MODULE HANDBOOK

## **Master of Arts**

Master Information Technology Management (FS-OI-  
MAITE-60)

60 CP

**Distance Learning**

Classification: Non-Consecutive

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# 1. Semester

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# IT Systems: Software

Module Code: DLMIMITSS\_E

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	MA	5	150 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimum 1 semester	WiSe/SoSe	English

## Module Coordinator

Prof. Dr. Carsten Skerra (IT Systems: Software)

## Contributing Courses to Module

- IT Systems: Software (DLMIMITSS01\_E)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

Study Format: myStudies  
Exam, 90 Minutes

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- Basics of software development
- Data formats and coding
- Firmware and operating systems
- Classification and application areas of desktop applications
- Databases
- Application-specific software systems in the company
- Ergonomic aspects of computer workstation design and human-machine interaction

**Learning Outcomes****IT Systems: Software**

On successful completion, students will be able to

- understand the basics of software development.
- evaluate data formats and their application in different scenarios.
- understand the storage and processing of complex data and information.
- evaluate operating systems and their conceptual differences for application and security.
- understand the application areas of typical desktop applications and assess their limitations.
- differentiate database-based enterprise solutions and evaluate their usefulness for business applications.
- identify requirements for computer workstations and implement suitable solutions.

**Links to other Modules within the Study Program**

This module is similar to other modules in the fields of Computer Science & Software Development

**Links to other Study Programs of the University**

All Master Programs in the IT & Technology fields



# IT Systems: Software

Course Code: DLMIMITSS01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

The course introduces the function and application areas of typical software systems used in companies. Concepts of software development and programming languages form the basis for this. The course provides the necessary knowledge about data formats, their conversion, compression and transformation in order to apply them to the representation of complex data. It describes operating systems for local and mobile computers and their conceptual differences and areas of application. Based on this, typical desktop applications from text to graphics processing are introduced and their field of application is explained. After an introduction to the concept of databases, typical server-based solutions for information management are discussed. The course concludes with an examination of ergonomic software aspects and human-machine interaction.

## Course Outcomes

On successful completion, students will be able to

- understand the basics of software development.
- evaluate data formats and their application in different scenarios.
- understand the storage and processing of complex data and information.
- evaluate operating systems and their conceptual differences for application and security.
- understand the application areas of typical desktop applications and assess their limitations.
- differentiate database-based enterprise solutions and evaluate their usefulness for business applications.
- identify requirements for computer workstations and implement suitable solutions.

## Contents

1. Basics of software development
  - 1.1 Fundamentals of programming and programming languages
  - 1.2 Software lifecycle
  - 1.3 Software licensing models and patenting
2. Data formats
  - 2.1 ASCII code, Unicode and markup languages
  - 2.2 Page description languages (HTML, XHTML, HTML5)
  - 2.3 Script languages for web applications
  - 2.4 Text formats

- 2.5 Raster, vector and meta graphic formats (PNG, TIFF, JPEG, SVG, WMF)
- 3. Conversion, compression and transformation of data
  - 3.1 Data conversion (XMI, Transcoding)
  - 3.2 Data compression
  - 3.3 Data transformation
  - 3.4 Application to audiovisual data
- 4. System software
  - 4.1 Firmware, BIOS, UEFI
  - 4.2 Operating systems for end users
  - 4.3 Server-based operating systems
  - 4.4 Mobile operating systems
- 5. Desktop applications
  - 5.1 Office software
  - 5.2 Graphics and image processing programs
  - 5.3 Software for mathematics and statistics
  - 5.4 Desktop publishing and visualization
  - 5.5 Audio and video systems
- 6. Database systems
  - 6.1 Relational databases and SQL
  - 6.2 NoSQL and non-relational databases
  - 6.3 In-memory databases
  - 6.4 Data warehouses
- 7. Business information systems
  - 7.1 Web-based systems and cloud solutions
  - 7.2 Document and content management
  - 7.3 Resource-based information management
  - 7.4 Knowledge management, dashboards and expert systems
- 8. Ergonomics at the computer workplace
  - 8.1 Anthropometry and system ergonomics
  - 8.2 Product and production ergonomics
  - 8.3 Computer workstation ergonomics
  - 8.4 Software ergonomics
  - 8.5 Design aspects of the graphical user interface

**Literature****Compulsory Reading****Further Reading**

- Bourke, P./Fairley, R.E. (Hrsg.) (2014): SWEBOK V3.0 – Guide to the Software Engineering Body of Knowledge. IEEE Computer Society.
- Brookshear, G., & Brylow, D. (2019). Computer science: An overview (13th ed.). Pearson.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## IT Systems: Hardware

Module Code: DLMIMITSH\_E

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	MA	5	150 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimum 1 semester	WiSe/SoSe	English

### Module Coordinator

Prof. Dr. Damir Ismailovic (IT Systems: Hardware)

### Contributing Courses to Module

- IT Systems: Hardware (DLMIMITSH01\_E)

### Module Exam Type

#### Module Exam

Study Format: myStudies  
Exam, 90 Minutes

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Computer Arithmetics
- Integrated Circuits
- Storage systems
- Input/output systems
- Fundamentals of data transmission
- Computer networks
- Server and data centers

**Learning Outcomes****IT Systems: Hardware**

On successful completion, students will be able to

- understand computer arithmetic and to apply it to logical problems.
- know the components of computer systems and explain their functional principles.
- differentiate methods of data transmission and evaluate their conceptual differences in application.
- evaluate computer network technologies and their fields of application.
- know and assess requirements for the construction and operation of data centers.

**Links to other Modules within the Study Program**

This module is similar to other modules in the fields of Computer Science & Software Development

**Links to other Study Programs of the University**

All Master Programs in the IT & Technology fields

## IT Systems: Hardware

Course Code: DLMIMITSH01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

This course provides an understanding of how computer-based systems work and serves as a basis for communication and leadership for appropriate information technology professionals. It describes the logic with which digital computers work and the technique of creating digital circuits. It also explains the structure of typical computer systems and the functioning of processors, memory devices and peripheral input and output devices. The course clarifies the basics of communications engineering and compares the application criteria of wired and wireless data transmission technologies. On this basis, small server infrastructures, mainframes and supercomputers are introduced and knowledge about the construction and operation of data centers is taught.

### Course Outcomes

On successful completion, students will be able to

- understand computer arithmetic and to apply it to logical problems.
- know the components of computer systems and explain their functional principles.
- differentiate methods of data transmission and evaluate their conceptual differences in application.
- evaluate computer network technologies and their fields of application.
- know and assess requirements for the construction and operation of data centers.

### Contents

1. Basics of computer arithmetics
  - 1.1 value arithmetic, numeral systems
  - 1.2 propositional logic and boolean operators
  - 1.3 Computer Arithmetics
2. Integrated Circuits
  - 2.1 Integrated circuits and semiconductor production
  - 2.2 Parallel and serial interfaces
  - 2.3 Mainboard components
  - 2.4 Processors and memory
3. Storage systems



- 3.1 Hard disk space
- 3.2 Optical storage media
- 3.3 Magnetic storage media
- 3.4 Solid State Drive
4. Input/output systems
  - 4.1 Input Devices
  - 4.2 Touch Screen Systems
  - 4.3 Graphical output devices
  - 4.4 Printer Systems
5. Fundamentals of data transmission
  - 5.1 Wired data transmission and modulation
  - 5.2 Transmission via light
  - 5.3 Antennas and satellite technology
  - 5.4 Mobile networks
  - 5.5 RFID and Near-Field Communication
6. Computer networks
  - 6.1 Network Topology
  - 6.2 Ethernet frame and network protocols
  - 6.3 Switching, routing and data flow control
  - 6.4 Network diagnostics
7. Server and data centers
  - 7.1 Data center Tier Classification Standard
  - 7.2 Server systems, mainframes and supercomputers
  - 7.3 Building data centers
  - 7.4 Data center security and operations aspects
  - 7.5 Principles of virtualization

**Literature****Compulsory Reading****Further Reading**

- Gómez, J. M., Mora, M., Raisinghani, M. S., Nebel, W., & O'Connor, R. V. (2017). Engineering and management of data centers: An IT service management approach. Springer.
- Hwaiyu Geng, P. E. (2014). Data center handbook. John Wiley & Sons.
- Tanenbaum, A. S., & Wetherall, D. (2014). Computer networks (5th ed.). Pearson Education.
- Van Steen, M., & Tanenbaum, A. S. (2017). Distributed systems. Maarten van Steen.

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

# Networks and Distributed Systems

Module Code: DLMCSNDS

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> None	<b>Study Level</b> MA	<b>CP</b> 5	<b>Student Workload</b> 150 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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## Module Coordinator

Uwe Behley (Networks and Distributed Systems)

## Contributing Courses to Module

- Networks and Distributed Systems (DLMCSNDS01)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

Study Format: myStudies  
Exam, 90 Minutes

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- Communication Networks
- Communication Protocols
- Distributed System Architectures
- Distributed Algorithms and Applications

**Learning Outcomes****Networks and Distributed Systems**

On successful completion, students will be able to

- explain the basic concepts of digital data transmission and computer networks.
- detail the ISO/OSI reference model and characterize aspects of its different layers.
- compare the ISO/OSI model to the TCP/IP protocol stack, its services, and its applications.
- elaborate on different approaches and architectures for distributed systems.
- describe the challenges and opportunities of distributed algorithms and applications.
- analyze different aspects of decentralized, mobile, and pervasive computing.

**Links to other Modules within the Study Program**

This module is similar to other modules in the field of Computer Science & Software Development.

**Links to other Study Programs of the University**

All Bachelor Programmes in the IT & Technology field.

# Networks and Distributed Systems

Course Code: DLMCSNDS01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

Isolated computer systems are becoming the exception, with modern systems typically connected to each other via networks. Through these networks, data is constantly exchanged via the internet using communication protocols. These allow modern computers to access data and functions from other computer systems, enabling distributed systems. In this distributed Systems algorithms and applications are partially mapped to different entities within the network to perform shared computing tasks. The knowledge transfer regarding the required technologies, architectures, and algorithms for doing so is the focus of this course.

## Course Outcomes

On successful completion, students will be able to

- explain the basic concepts of digital data transmission and computer networks.
- detail the ISO/OSI reference model and characterize aspects of its different layers.
- compare the ISO/OSI model to the TCP/IP protocol stack, its services, and its applications.
- elaborate on different approaches and architectures for distributed systems.
- describe the challenges and opportunities of distributed algorithms and applications.
- analyze different aspects of decentralized, mobile, and pervasive computing.

## Contents

1. Computer Networks
  - 1.1 Basic Concepts of Digital Data Transmission
  - 1.2 Network Topologies and Interconnections
  - 1.3 Basics of Communication Engineering and Coding Theory
  - 1.4 The Physical Layer: Transmission Methods and Media
2. Communication Protocols
  - 2.1 The ISO/OSI Reference Model
  - 2.2 The Data Link Layer: Standards and Technologies
  - 2.3 The Network Layer: Addressing and Routing
  - 2.4 The Transport Layer: Reliability and Flow Control
3. The Internet Protocol Suite

- 3.1 History of the Internet and the World Wide Web
- 3.2 The TCP/IP Reference Model and Protocol Stack
- 3.3 Examples of Internet Protocols and Services
- 3.4 Security Aspects of Communication on the Internet
  
4. Architectures of Distributed Systems
  - 4.1 Client-Server Architectures
  - 4.2 Service-Oriented Architectures, Web- and Micro-Services
  - 4.3 Edge and Cloud Computing
  - 4.4 Peer-to-Peer Computing
  
5. Distributed Algorithms and Applications
  - 5.1 Communication and Synchronization in Distributed Systems
  - 5.2 Distributed Algorithms (Concurrency and Parallel Processing)
  - 5.3 Transactions and Data Management (Consistency and Replication)
  - 5.4 Security Aspects for Distributed Services and Applications
  
6. From Distributed Systems to Ubiquitous Computing
  - 6.1 Distributed Ledger Technology
  - 6.2 Aspects of Mobile Computing
  - 6.3 Aspects of Pervasive Computing and the Internet of Things

## Literature

### Compulsory Reading

### Further Reading

- Comer, D. E. (2015). Computer networks and internets (global ed., 6th ed.). Pearson Education.
- Comer, D. E. (2018). The internet book: Everything you need to know about computer networking and how the internet works (5th ed.). CRC Press.
- Kurose, J., & Keith R. (2017). Computer networking: A top-down approach, global edition (7th ed.). Pearson Education.
- Tanenbaum, A. S., & Wetherall, D. J. (2011). Computer networks: New international edition (5th ed.). Pearson Education.
- Van Steen, M., & Tanenbaum, A. S. (2017). Distributed systems (3rd ed.). CreateSpace Independent Publishing Platform.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## IT Governance and Compliance

Module Code: DLMBITGSM2

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 5	<b>Student Workload</b> 150 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Dr. Radiah Rivu (IT Governance and Compliance)

### Contributing Courses to Module

- IT Governance and Compliance (DLMBITGSM02)

### Module Exam Type

#### Module Exam

Study Format: myStudies  
Exam, 90 Minutes

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Establishing IT governance and compliance
- COBIT framework
- IT governance frameworks
- Data protection and data security

**Learning Outcomes****IT Governance and Compliance**

On successful completion, students will be able to

- explain IT governance and compliance both as tools to achieve organizational goals and to satisfy regulatory requirements.
- know the different IT governance frameworks given, in particular the industry standard model COBIT.
- set out the processes and policies for administering and managing IT systems for ensuring compliance with local and international regulatory requirements.
- understand that ensuring compliance with the IT governance framework can be a daunting task that requires constant collection, organization, monitoring, analysis and reporting on event logs to detect and manage control-related activity.
- recognize the IT governance and compliance monitoring tools for ensuring that controls for information systems are effectively implemented, monitored, and maintained.

**Links to other Modules within the Study Program**

This module is similar to other modules in the field of Computer Science & Software Development.

**Links to other Study Programs of the University**

All Master Programmes in the IT & Technology field.

## IT Governance and Compliance

Course Code: DLMBITGSM02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

IT governance and compliance are key elements within corporate governance, since most modern businesses rely heavily on IT infrastructure for their success. These elements detail the required leadership and organizational structures for maintaining and extending information technology in order to meet business strategies and objectives.

### Course Outcomes

On successful completion, students will be able to

- explain IT governance and compliance both as tools to achieve organizational goals and to satisfy regulatory requirements.
- know the different IT governance frameworks given, in particular the industry standard model COBIT.
- set out the processes and policies for administering and managing IT systems for ensuring compliance with local and international regulatory requirements.
- understand that ensuring compliance with the IT governance framework can be a daunting task that requires constant collection, organization, monitoring, analysis and reporting on event logs to detect and manage control-related activity.
- recognize the IT governance and compliance monitoring tools for ensuring that controls for information systems are effectively implemented, monitored, and maintained.

### Contents

1. About IT Governance
  - 1.1 Concept and Definitions
  - 1.2 The Value of IT in the Organization
  - 1.3 Current State and Perceptions
  - 1.4 Governance, Compliance and Risk Management in IT
2. Establishing IT Governance and Compliance
  - 2.1 Assessment
  - 2.2 IT Strategy
  - 2.3 Tactics
  - 2.4 Operations

- 2.5 Compliance
- 2.6 Performance
3. The COBIT Framework
  - 3.1 Overview of COBIT
  - 3.2 The COBIT Goals Cascade
  - 3.3 The COBIT Process Reference Model
  - 3.4 Deploying and Implementing COBIT
4. IT Governance Frameworks
  - 4.1 Quality Management as a Foundation
  - 4.2 ISO 9000 Family
  - 4.3 Maturity Models
  - 4.4 Relationship to Service and Architecture Frameworks (ITIL, TOGAF)
  - 4.5 Relationship to IT Security Frameworks (ISO 27000 family)
5. Data Protection and IT Security
  - 5.1 Data Protection
  - 5.2 IT Security Management
  - 5.3 IT Security Threats and Attack Scenarios
  - 5.4 Countermeasures
  - 5.5 Cryptography

**Literature****Compulsory Reading****Further Reading**

- Calder, A., & Watkins, S. G. (2020). IT governance [electronic resource]: an international guide to data security and ISO 27001/ISO 27002 (Seventh Edition). KoganPage.

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests



## IT Service Management

Module Code: DLMBITGSM1

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 5	<b>Student Workload</b> 150 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. André Köhler (IT Service Management)

### Contributing Courses to Module

- IT Service Management (DLMBITGSM01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

Study Format: myStudies  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- IT infrastructure library (ITIL)
- ITIL service strategy
- ITIL service design
- ITIL service transition
- ITIL service operation

**Learning Outcomes****IT Service Management**

On successful completion, students will be able to

- understand IT service management as the enabler of information technology strategies and operations objectives.
- define the touchpoints between IT service management and management information systems.
- differentiate between lightweight and heavyweight approaches to IT service management.
- understand benchmarks and assessments to measure the capability of a service provider and its IT service management competences.
- apply IT services management tools and platforms proactively based on current information technology research and advisory.

**Links to other Modules within the Study Program**

This module is similar to other modules in the field of Computer Science & Software Development.

**Links to other Study Programs of the University**

All Master Programmes in the IT & Technology field.

# IT Service Management

Course Code: DLMBITGSM01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

This course focuses on the nature and practice of IT services that keep IT systems running. It introduces students to the knowledge and experience needed to provide IT as a service to organizations, mainly based on the IT Infrastructure Library (ITIL) which is the industry standard for this purpose.

## Course Outcomes

On successful completion, students will be able to

- understand IT service management as the enabler of information technology strategies and operations objectives.
- define the touchpoints between IT service management and management information systems.
- differentiate between lightweight and heavyweight approaches to IT service management.
- understand benchmarks and assessments to measure the capability of a service provider and its IT service management competences.
- apply IT services management tools and platforms proactively based on current information technology research and advisory.

## Contents

1. Introduction to IT Service Management
  - 1.1 IT Services, Business IT Services
  - 1.2 Service Level Agreement (SLA)
  - 1.3 IT Service Management
  - 1.4 Reference Models for IT Service Management
2. IT Infrastructure Library (ITIL)
  - 2.1 Purpose and content of the IT Infrastructure Library
  - 2.2 Service Live Cycle in ITIL
  - 2.3 Overview on Service Strategy and Operational Processes
  - 2.4 Continual Service Improvement
3. ITIL – Service Strategy

- 3.1 Business Relationship Management
- 3.2 Service Portfolio Management
- 3.3 Financial Management for Services
- 3.4 Demand Management
  
4. ITIL – Operational Processes: Service Design
  - 4.1 Service Level Management
  - 4.2 Service Catalogue Management
  - 4.3 Availability Management
  - 4.4 Service Continuity Management
  
5. ITIL – Operational Processes: Service Transition
  - 5.1 Transition Planning and Support
  - 5.2 Change Management
  - 5.3 Service Asset and Configuration Management
  - 5.4 Release and Deployment Management
  
6. ITIL – Operational Processes: Service Operation
  - 6.1 Incident Management
  - 6.2 Problem Management
  - 6.3 Request Fulfilment
  - 6.4 Event Management

**Literature****Compulsory Reading****Further Reading**

- Love, V. D. & Ness, L. R. (2016). Integrating ITSM into the Corporate Environment. *Journal of Health Care Compliance*, 18(3), 5–12.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests

## Advanced Research Methods

Module Code: DLMARM

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 5	<b>Student Workload</b> 150 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Tamara Wehrstein (Advanced Research Methods)

### Contributing Courses to Module

- Advanced Research Methods (DLMARM01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Written Assessment: Written Assignment

Study Format: myStudies  
Written Assessment: Written Assignment

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Social Science and Research Paradigms
- Case Study Research
- Specific Topics of Qualitative Research
- Advanced Issues of Qualitative Research Conceptualization and Data Analysis
- Underlying Assumptions of Quantitative Research: Concepts and Consequences
- Evaluation Research

**Learning Outcomes****Advanced Research Methods**

On successful completion, students will be able to

- understand and apply scientific methodologies in conducting empirical research.
- plan, design, and prepare research proposals.
- differentiate between different types of case studies, select and apply different data collection strategies.
- plan, conduct, and analyze case studies and surveys.
- scientifically analyze quantitative and qualitative data.
- conduct evaluation research to determine quality of research.

**Links to other Modules within the Study Program**

This module is similar to other modules in the field of Methods

**Links to other Study Programs of the University**

All Master Programmes in the Business & Management fields



## Advanced Research Methods

Course Code: DLMARM01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Advanced research methods, specifically business research, is scientific inquiry that attempts to uncover new information which helps a business improve performance, maximizing shareholder value while adhering to ethical and moral compliance standards. Managers seeking to conduct empirical research must maintain validity, reliability, and trustworthiness when utilizing scientific methodologies in order to produce meaningful and actionable results. Research proposals are typically written prior to conducting research, which have a certain structure, enabling the researcher to properly plan, conduct, and analyze case studies and surveys. Different data collection strategies are used to collect both qualitative and quantitative data, depending on the research proposal goals. Managers utilize their understanding of research methodologies to accurately assess the quality of research.

### Course Outcomes

On successful completion, students will be able to

- understand and apply scientific methodologies in conducting empirical research.
- plan, design, and prepare research proposals.
- differentiate between different types of case studies, select and apply different data collection strategies.
- plan, conduct, and analyze case studies and surveys.
- scientifically analyze quantitative and qualitative data.
- conduct evaluation research to determine quality of research.

### Contents

1. Theoretical Background: Social Science and Research Paradigms
  - 1.1 What is a Paradigm?
  - 1.2 Empiricism
  - 1.3 Critical Rationalism
  - 1.4 Epistemological Anarchism
  - 1.5 Structural Functionalism
  - 1.6 Symbolic Interactionism
  - 1.7 Ethnomethodology
2. Case Study Research

- 2.1 Types of Case Study Research
- 2.2 Maintaining Quality in Case Study Research
- 2.3 Case Study Design
- 2.4 Implementing Case Studies
- 2.5 Analyzing Case Studies
3. Specific Topics of Qualitative Research
  - 3.1 Idea Generation
  - 3.2 Critical Incident Technique
  - 3.3 Understanding Communication: Discourse Analysis
  - 3.4 Perceiving Perception: Interpretive Phenomenological Analysis
4. Advanced Issues of Qualitative Research Conceptualizing and Data Analysis
  - 4.1 Measurement Theory
  - 4.2 Index and Scale Construction
  - 4.3 Types of Scale Construction
  - 4.4 The Problem of Nonresponse and Missing Data
  - 4.5 Implications of IT for Research Strategies
5. Underlying Assumptions of Quantitative Research: Concepts and Consequences
  - 5.1 Classical Test Theory
  - 5.2 Probabilistic Test Theory
  - 5.3 Advanced Topics of Test Theory
6. Evaluation Research
  - 6.1 What is Evaluation Research?
  - 6.2 Types of Evaluation Research
  - 6.3 Meta-Analysis
  - 6.4 Meta-Evaluation

**Literature****Compulsory Reading****Further Reading**

- Babbie, E. R. (2021). The practice of social research (15th ed.). Cengage Learning. - 14th ed. (2016)
- Crossman, A. (2019) How to conduct an index for research. (URL: <https://www.thoughtco.com/index-for-research-3026543> [last accessed on 15.03.2023]).
- Eurostat (n.d.) Beginners: Statistical concept - Index and base year (URL: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Beginners:Statistical\\_concept\\_-\\_Index\\_and\\_base\\_year](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Beginners:Statistical_concept_-_Index_and_base_year) [last accessed on 15.03.2023]).
- Giles, D. (2004). Advanced research methods in psychology (Reprint). Psychology Press.
- Rea, L.M. & Parker, R.A. (2014). Designing and conducting survey research: A comprehensive guide, (4th ed). Jossey-Bass.
- Saunders, M., Thornhill, A., & Lewis, P. (2019). Research methods for business students (8th ed). Pearson
- Takahashi, A. R. W., & Araujo, L. (2019). Case study research: Opening up research opportunities. RAUSP Management Journal, 55(1), 100–111.
- Widner, J., Woolcock, M., & Ortega Nieto, D. (Eds.). (2022). The case for case studies: Methods and applications in international development (strategies for social inquiry). Cambridge University Press.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

## 2. Semester

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## IT Strategy

Module Code: DLMITITS

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 5	<b>Student Workload</b> 150 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Dr. Tamir Libel (IT Strategy)

### Contributing Courses to Module

- IT Strategy (DLMITITS01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- The Role of the IT Strategy for a Company
- Developing an IT Strategy
- Implementing an IT Strategy
- Measuring the Impact of an IT Strategy
- Adapting the IT Strategy
- Specific Aspects of an IT Strategy: Typical Business Demands
- Building Blocks of an IT Strategy

**Learning Outcomes****IT Strategy**

On successful completion, students will be able to

- analyze the current state of business requirements and IT situations,
- develop an IT strategy and ensure stakeholder engagement,
- align the IT strategy with IT governance, IT service management, IT compliance, business goals and strategy, and human resources,
- measure and control the impact of the strategy,
- develop a sourcing plan and a project portfolio,
- develop goals for application portfolios and the IT infrastructure.
- consider the relevance of people & society when implementing an IT strategy,
- reflect intercultural aspects of an IT strategy, as they can result from global Mergers & Acquisitions or outsourcing.

**Links to other Modules within the Study Program**

This module is similar to other modules in the field of Computer Science & Software Development

**Links to other Study Programs of the University**

All Master Programs in the IT & Technology field



# IT Strategy

Course Code: DLMITITS01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

An IT strategy is a plan of how to reach defined business and IT goals. It is closely connected to topics such as governance, strategy and management in both business and IT terms. An IT strategy must be developed in accordance with external factors, it must be put into action, results must be measured and the strategy must continuously be adapted to a changing environment and the experiences made. The IT strategy is an important tool in aligning corporate IT to business requirements. Important elements of an IT strategy include the contribution of IT to business value generation, applications, IT infrastructure, project portfolio management and sourcing options.

## Course Outcomes

On successful completion, students will be able to

- analyze the current state of business requirements and IT situations,
- develop an IT strategy and ensure stakeholder engagement,
- align the IT strategy with IT governance, IT service management, IT compliance, business goals and strategy, and human resources,
- measure and control the impact of the strategy,
- develop a sourcing plan and a project portfolio,
- develop goals for application portfolios and the IT infrastructure.
- consider the relevance of people & society when implementing an IT strategy,
- reflect intercultural aspects of an IT strategy, as they can result from global Mergers & Acquisitions or outsourcing.

## Contents

1. The Role of the IT Strategy for a Company
  - 1.1 Elements of IT in a Company: Demands, Organization, Processes, Technology
  - 1.2 What is an IT Strategy?
  - 1.3 IT Strategy in the Context of Governance and Management
  - 1.4 Strategy Lifecycle
2. Developing an IT Strategy
  - 2.1 Business Goals and External Factors
  - 2.2 IT Goals

- 2.3 Methods for Strategy Development
- 3. Implementing an IT Strategy
  - 3.1 Communicating a Strategy
  - 3.2 Adapting the Organization and its Processes
  - 3.3 Roadmaps and Portfolio Management
  - 3.4 Leading People & Change Management
- 4. Measuring the Impact of an IT Strategy
  - 4.1 Why Measurement is Key to Success
  - 4.2 Ways to Measure Strategy Impact
  - 4.3 Evaluation and Reporting of Results
- 5. Adapting the IT Strategy
  - 5.1 Sources for Change: Feedback, Reviews, Results
  - 5.2 Ways to Improve the Strategy
- 6. Specific Aspects of an IT Strategy: Typical Business Demands
  - 6.1 Implementing Business Requirements & Business IT Alignment
  - 6.2 Reducing Costs, Increasing Speed and Quality
  - 6.3 Time to Market
  - 6.4 Compliance
  - 6.5 Mergers & Acquisitions
- 7. Building Blocks of an IT Strategy
  - 7.1 IT Governance, Risk Management and Security
  - 7.2 IT Service Management & Infrastructure
  - 7.3 Application Portfolio Management & Enterprise Architecture Management
  - 7.4 Sourcing & Cloud Strategy
  - 7.5 Human Resources & Leadership

**Literature****Compulsory Reading****Further Reading**

- Hanschke, I. (2010). Strategic IT management: A toolkit for enterprise architecture management. Springer.
- High, P. A. (2014). Implementing world class IT strategy: How IT can drive organizational innovation. John Wiley & Sons.
- Axelos Limited. (2020). ITIL® 4: Digital and IT strategy. The Stationery Office.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

# Artificial Intelligence

Module Code: DLMIMWKI

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	MA	10	300 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimaldauer: 1 Semester	WiSe/SoSe	English

## Module Coordinator

Prof. Dr. Claudia Heß (Artificial Intelligence) / Prof. Dr. Tim Schlippe (Seminar: AI and Society)

## Contributing Courses to Module

- Artificial Intelligence (DLMAIAI01)
- Seminar: AI and Society (DLMAISAI01)

## Module Exam Type

### Module Exam

### Split Exam

#### Artificial Intelligence

- Study Format "Distance Learning": Exam, 90 Minutes
- Study Format "myStudies": Exam, 90 Minutes

#### Seminar: AI and Society

- Study Format "Distance Learning": Written Assessment: Research Essay
- Study Format "myStudies": Written Assessment: Research Essay

## Weight of Module

see curriculum

### Module Contents

#### Artificial Intelligence

- History of AI
- AI application areas
- Expert systems
- Neuroscience
- Modern AI systems

#### Seminar: AI and Society

In this module, students will reflect on current societal and political implications of artificial intelligence. To this end, pertinent topics will be introduced via articles that are then critically evaluated by the students in the form of a written essay.

### Learning Outcomes

#### Artificial Intelligence

On successful completion, students will be able to

- remember the historical developments in the field of artificial intelligence.
- analyze the different application areas of artificial intelligence.
- comprehend expert systems.
- apply Prolog to simple expert systems.
- comprehend the brain and cognitive processes from a neuro-scientific point of view.
- understand modern developments in artificial intelligence.

#### Seminar: AI and Society

On successful completion, students will be able to

- name selected current societal topics and issues in artificial intelligence.
- explain the influence and impact of artificial intelligence on societal, economic, and political topics.
- transfer theoretically-acquired knowledge to real-world cases.
- treat in a scientific manner a select topic in the form of a written essay.
- critically question and discuss current societal and political issues arising from the recent advances in artificial intelligence methodology.
- develop own problem-solving skills and processes through reflection on the possible impact of their future occupation in the sector of artificial intelligence.

#### Links to other Modules within the Study Program

This module is similar to other modules in the field of Data Science & Artificial Intelligence.

#### Links to other Study Programs of the University

All Master Programmes in the IT & Technology field.

# Artificial Intelligence

Course Code: DLMAIAI01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

The quest for artificial intelligence has captured humanity's interest for many decades and has been an active research area since the 1960s. This course will give a detailed overview of the historical developments, successes, and set-backs in AI, as well as the development and use of expert systems in early AI systems. In order to understand cognitive processes, the course will give a brief overview of the biological brain and (human) cognitive processes and then focus on the development of modern AI systems fueled by recent developments in hard- and software. Particular focus will be given to discussion of the development of "narrow AI" systems for specific use cases vs. the creation of general artificial intelligence. The course will give an overview of a wide range of potential application areas in artificial intelligence, including industry sectors such as autonomous driving and mobility, medicine, finance, retail, and manufacturing.

## Course Outcomes

On successful completion, students will be able to

- remember the historical developments in the field of artificial intelligence.
- analyze the different application areas of artificial intelligence.
- comprehend expert systems.
- apply Prolog to simple expert systems.
- comprehend the brain and cognitive processes from a neuro-scientific point of view.
- understand modern developments in artificial intelligence.

## Contents

1. History of AI
  - 1.1 Historical Developments
  - 1.2 AI Winter
  - 1.3 Notable Advances in AI
2. Expert Systems
  - 2.1 Overview Over Expert Systems
  - 2.2 Introduction to Prolog
3. Neuroscience
  - 3.1 The (Human) Brain

3.2 Cognitive Processes

4. Modern AI Systems

4.1 Recent Developments in Hard- and Software

4.2 Narrow vs General AI

4.3 NLP and Computer Vision

5. AI Application Areas

5.1 Autonomous Vehicles & Mobility

5.2 Personalized Medicine

5.3 FinTech

5.4 Retail & Industry

**Literature**

**Compulsory Reading**

**Further Reading**

- Chowdhary, K. R. (2020). Fundamentals of Artificial Intelligence. Springer India.
- Russell, S. & Norvig, P. (2022). Artificial intelligence. A modern approach (4th ed.). Pearson Education.
- Ward, J. (2020). The student's guide to cognitive neuroscience. (4th ed.). Taylor & Francis Group.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## Seminar: AI and Society

Course Code: DLMAISAI01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

In the current decade, impressive advances have been achieved in the field of artificial intelligence. Several cognitive tasks like object recognition in images and video, natural language processing, game strategy, and autonomous driving and robotics are now being performed by machines at unprecedented levels of ability. This course will examine some of societal, economic, and political implications of these developments.

### Course Outcomes

On successful completion, students will be able to

- name selected current societal topics and issues in artificial intelligence.
- explain the influence and impact of artificial intelligence on societal, economic, and political topics.
- transfer theoretically-acquired knowledge to real-world cases.
- treat in a scientific manner a select topic in the form of a written essay.
- critically question and discuss current societal and political issues arising from the recent advances in artificial intelligence methodology.
- develop own problem-solving skills and processes through reflection on the possible impact of their future occupation in the sector of artificial intelligence.

### Contents

- The seminar covers current topics concerning the societal impact of artificial intelligence. Each participant must create a seminar paper on a topic assigned to him/her. A current list of topics is given in the Learning Management System.

**Literature****Compulsory Reading****Further Reading**

- Bailey, S. J. (2020). Academic writing for international students of business and economics (Third edition). Routledge.
- Day, T. (2018). Success in academic writing. (Second edition)
- Fang, Z. (2021). Demystifying academic writing: genres, moves, skills, and strategies. Routledge, Taylor & Francis Group.
- Silvia, P. J. (2019). How to write a lot: a practical guide to productive academic writing (Second edition). American Psychological Association.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Seminar
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Research Essay

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Seminar
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Research Essay

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Applied Cyber Security and Data Protection

Module Code: DLMITEACSDP

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> <ul style="list-style-type: none"> <li>▪ DLMCSITSDP01 or DLMCSITSDS01</li> <li>▪ none</li> </ul>	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b>	<b>Regularly offered in</b>	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Ralf Kneuper (Cyber Security and Data Protection) / Prof. Dr. Ahmed Taha (Project: Current Challenges of Cyber Security)

### Contributing Courses to Module

- Cyber Security and Data Protection (DLMCSITSDP01)
- Project: Current Challenges of Cyber Security (DLMCSEPCCCS01\_E)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Cyber Security and Data Protection

- Study Format "Distance Learning": Oral Assignment
- Study Format "myStudies": Oral Assignment

##### Project: Current Challenges of Cyber Security

- Study Format "Distance Learning": Written Assessment: Project Report
- Study Format "myStudies": Written Assessment: Project Report

### Weight of Module

see curriculum

### Module Contents

#### Cyber Security and Data Protection

- Data protection and privacy
- Cyber security building blocks
- Cyber security management
- Cryptography concepts
- Cryptography applications

#### Project: Current Challenges of Cyber Security

Computer Security is constantly evolving. This course brings the student in touch with the state-of-the-art security research and practice by applying his/her knowledge to a current problem in this field.

### Learning Outcomes

#### Cyber Security and Data Protection

On successful completion, students will be able to

- explain the core concepts of cyber security, data protection, and cryptography including their differences and relationships.
- compare the approaches to data protection within in different legal systems.
- apply data protection concepts to data science and other application scenarios.
- analyze application scenarios to identify the adequate cyber security management measures that should be implemented.
- explain the different approaches to data protection in different cultures.

#### Project: Current Challenges of Cyber Security

On successful completion, students will be able to

- complete a project in the field of computer security that includes a research angle.
- explore computer security beyond the established state of the art.
- write a report highlighting the student's contribution to the interdisciplinary science of computer security.
- contribute to the state-of-the-art in computer security.

#### Links to other Modules within the Study Program

This module is similar to other modules in the fields of Computer Science & Software Development

#### Links to other Study Programs of the University

All Master Programs in the IT & Technology fields



# Cyber Security and Data Protection

Course Code: DLMCSITSDP01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

With the increasing digitization and networking of IT systems, the need for safeguarding systems and the data processed by these systems has grown. The aim of this module is to provide an understanding of security measures needed, cyber security including cryptography, and data protection. While the need for cyber security is similar around the world, different cultures have different expectations regarding data protection and privacy. Nevertheless, personal data are often processed outside the country where the affected individuals live. Hence, the cultural aspects of data protection need to be taken into account wherever the data are processed. This course provides an overview of the main cyber security measures in different application scenarios, as well as their integration into an Information Security Management System, with particular focus on the relevant ISO/IEC 270xx family of standards. Cryptography provides an important tool set for cyber security and is used in many different application scenarios such as secure Internet protocols and block chain.

## Course Outcomes

On successful completion, students will be able to

- explain the core concepts of cyber security, data protection, and cryptography including their differences and relationships.
- compare the approaches to data protection within in different legal systems.
- apply data protection concepts to data science and other application scenarios.
- analyze application scenarios to identify the adequate cyber security management measures that should be implemented.
- explain the different approaches to data protection in different cultures.

## Contents

1. Foundations of Data Protection and Cyber Security
  - 1.1 Terminology and Risk Management
  - 1.2 Core Concepts of Cyber Security
  - 1.3 Core Concepts of Data Protection and Privacy
  - 1.4 Core Concepts of Cryptography
  - 1.5 Legal Aspects
2. Data Protection

- 2.1 Basic Concepts of Data Protection (ISO/IEC 29100, Privacy by Design)
- 2.2 Data Protection in Europe: the GDPR
- 2.3 Data Protection in the USA
- 2.4 Data Protection in Asia
3. Applying Data Protection
  - 3.1 Anonymity and Pseudonyms (k-Anonymity, i-Diversity, Differential Privacy)
  - 3.2 Data Protection in Data Science and Big Data
  - 3.3 User Tracking in Online Marketing
  - 3.4 Cloud Computing
4. Building Blocks of Cyber Security
  - 4.1 Authentication, Access Management and Control
  - 4.2 Cyber Security in Networks
  - 4.3 Developing Secure IT Systems (OWASP, etc.)
5. Cyber Security Management
  - 5.1 Security Policy
  - 5.2 Security and Risk Analysis
  - 5.3 The ISO 270xx Series
  - 5.4 IT Security and IT Governance
  - 5.5 Example: Cyber Security for Credit Cards (PCI DSS)
6. Cryptography
  - 6.1 Symmetric Cryptography
  - 6.2 Asymmetric Cryptography
  - 6.3 Hash Functions
  - 6.4 Secure Data Exchange (Diffie-Hellman, Perfect Forward Secrecy, etc.)
7. Cryptographic Applications
  - 7.1 Digital Signatures
  - 7.2 Electronic Money
  - 7.3 Secure Internet Protocols (TLS, IPSec, etc.)
  - 7.4 Block Chain

**Literature****Compulsory Reading****Further Reading**

- Amoroso, E., & Amoroso, M. (2017). From CIA to APT: An introduction to cyber security. Independently published.
- National Institute of Standards and Technology. (2018). Framework for improving critical infrastructure cybersecurity.
- Paar, C., & Pelzl, J. (2011). Understanding cryptography: A textbook for students and practitioners. Springer.
- Walker, B. (2019). Cyber security comprehensive beginners guide to learn the basics and effective methods of cyber security. Independently published.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

## Project: Current Challenges of Cyber Security

Course Code: DLMCSEPCCCS01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	DLMCSITSDP01 or DLMCSITSDS01

### Course Description

Computer Security is constantly evolving. In this project, students will have the opportunity to contribute to the interdisciplinary science of computer security by applying their knowledge to a current topic in computer science that requires a comprehensive novel computer security approach. Topics may be the analysis of a particular threat, a report and analysis of a new security technology, the implementation of a security solution or a project specifically using security best practices, etc. In this way, students can demonstrate proficiency of computer security and prepare for the Master's thesis.

### Course Outcomes

On successful completion, students will be able to

- complete a project in the field of computer security that includes a research angle.
- explore computer security beyond the established state of the art.
- write a report highlighting the student's contribution to the interdisciplinary science of computer security.
- contribute to the state-of-the-art in computer security.

### Contents

- To a given problem and/or a given context, the student will research the subject, develop an appropriate solution and then submit the report and if appropriate any code and specific data. Specific problems and contexts will be provided by the tutor but proposals by the students can be considered.

**Literature****Compulsory Reading****Further Reading**

- Case Studies (Cyber): <https://www.securitymagazine.com/topics/2664-case-studies-cyber>
- Falliere, N. / O Murchu, L. / Chien, E. (2010): W32.Stuxnet Dossier. Symantec, Tempe, AZ. [https://www.wired.com/images\\_blogs/threatlevel/2010/11/w32\\_stuxnet\\_dossier.pdf](https://www.wired.com/images_blogs/threatlevel/2010/11/w32_stuxnet_dossier.pdf)
- Hacquebord, F. (2020): Pawn Storm in 2019 A Year of Scanning and Credential Phishing on High-Profile Targets. Trend Micro Research, Irving, TX. [https://documents.trendmicro.com/assets/white\\_papers/wp-pawn-storm-in-2019.pdf](https://documents.trendmicro.com/assets/white_papers/wp-pawn-storm-in-2019.pdf)
- Vulnerability Notes Database: <https://www.kb.cert.org/vuls/>

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline



**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Big Data Applications

Module Code: DLMITEBDA

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	MA	10	300 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimum 1 semester	WiSe/SoSe	English

### Module Coordinator

Prof. Dr. Christian Müller-Kett (Big Data Technologies) / Radiah Rivu (Data Utilization)

### Contributing Courses to Module

- Big Data Technologies (DLMDSBDT01)
- Data Utilization (DLMBBD01)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Big Data Technologies

- Study Format "myStudies": Oral Assignment
- Study Format "Distance Learning": Oral Assignment

##### Data Utilization

- Study Format "myStudies": Exam, 90 Minutes
- Study Format "Distance Learning": Exam, 90 Minutes

### Weight of Module

see curriculum

### Module Contents

#### Big Data Technologies

- Data types and data sources
- Databases
- Modern storage frameworks
- Data formats
- Distributed computing

#### Data Utilization

- Pattern recognition
- Natural language processing
- Image recognition
- Detection and sensing
- Problem-solving
- Decision-making

### Learning Outcomes

#### Big Data Technologies

On successful completion, students will be able to

- identify different types and sources of data.
- understand different database concepts.
- learn to build new database structures.
- evaluate various data storage frameworks w.r.t. project requirements.
- analyze which data format to use for a given project.
- understand what roles you could take in such projects.
- create a distributed computing environment for a given project.
- understand the ethical impact of big data technology choices.

#### Data Utilization

On successful completion, students will be able to

- understand how identity, similarity, and diversity of data can be utilized in problem-solving approaches.
- differentiate between complicated and complex systems of investigation.
- identify the variability of a problem under investigation.
- distinguish between invariant and dynamic features of an investigated system.
- synthesize gained insights to propose a reliable data analytics solution.
- apply different approaches for acquiring and using a knowledge management system.

#### Links to other Modules within the Study Program

This module is similar to other modules in the field of Data Science & Artificial Intelligence

#### Links to other Study Programs of the University

All Master Programmes in the IT & Technology field

## Big Data Technologies

Course Code: DLMDSBDT01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Data are often considered the “new oil”, the raw material from which value is created. To harness the power of data, the data need to be stored and processed on a technical level. This course introduces the four “Vs” of data, as well as typical data sources and types. This course then discusses how data are stored in databases. Particular focus is given to database structures and different types of databases, e.g., relational, noSQL, NewSQL, and time-series. Beyond classical and modern databases, this course covers a wide range of storage frameworks such as distributed filesystems, streaming, and query frameworks. This is complemented by a detailed discussion of data storage formats ranging from classical approaches such as CSV and HDF5 to more modern approaches like Apache Arrow and Parquet. Finally, this course gives an overview of distributed computing environments based on local clusters, cloud computing facilities, and container-based approaches.

### Course Outcomes

On successful completion, students will be able to

- identify different types and sources of data.
- understand different database concepts.
- learn to build new database structures.
- evaluate various data storage frameworks w.r.t. project requirements.
- analyze which data format to use for a given project.
- understand what roles you could take in such projects.
- create a distributed computing environment for a given project.
- understand the ethical impact of big data technology choices.

### Contents

1. Data Types and Data Sources
  - 1.1 The 4Vs of data: volume, velocity, variety, veracity
  - 1.2 Data sources
  - 1.3 Data types
2. Databases
  - 2.1 Database structures
  - 2.2 Introduction to SQL

- 2.3 Relational databases
- 2.4 nonSQL, NewSQL databases
- 2.5 Timeseries DB
3. Modern data storage frameworks
  - 3.1 Distributed Filesystems
  - 3.2 Streaming frameworks
  - 3.3 Query frameworks
4. Data formats
  - 4.1 Traditional data exchange formats
  - 4.2 Apache Arrow
  - 4.3 Apache Parquet
5. Distributed Computing
  - 5.1 Cluster-based approaches
  - 5.2 Containers
  - 5.3 Cloud-based approaches

**Literature****Compulsory Reading****Further Reading**

- Date, C. J. (2003). An introduction to database systems. Pearson.
- Kleppmann, M. (2017). Designing data-intensive applications. O'Reilly.
- Wiese, L. (2015). Advanced data management. De Gruyter.

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed <input checked="" type="checkbox"/> Creative Lab	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Reader <input checked="" type="checkbox"/> Video	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Data Utilization

Course Code: DLMBBD01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

The course Data Utilization introduces case-based applications that take advantage of regularities and patterns found within continuously generated texts, images, or sensor data. The cases solve issues of pattern recognition, natural language processing, image recognition, detection and sensing, problem-solving, and decision support. The cases are related to the application fields of cybersecurity, linguistics, augmented reality, intelligent transportation, problem-solving, and decision support.

### Course Outcomes

On successful completion, students will be able to

- understand how identity, similarity, and diversity of data can be utilized in problem-solving approaches.
- differentiate between complicated and complex systems of investigation.
- identify the variability of a problem under investigation.
- distinguish between invariant and dynamic features of an investigated system.
- synthesize gained insights to propose a reliable data analytics solution.
- apply different approaches for acquiring and using a knowledge management system.

### Contents

1. Introduction
  - 1.1 The Meaning of Identity, Similarity, and Diversity
  - 1.2 Data Patterns and Ontologies
2. Pattern Recognition
  - 2.1 Analysis of User Interaction, Attitude, and Behavior
  - 2.2 Predictive Analytics
  - 2.3 Preventing the Unknown: User Behavior Analytics in Cybersecurity
3. Natural Language Processing
  - 3.1 Concepts of Natural Language
  - 3.2 Speech Recognition and Acoustic Modeling
  - 3.3 Discerning the Meaning: Linguistics and Social Media



4. Image Recognition
  - 4.1 Basics of Image Representation
  - 4.2 Integral Transforms and Compression
  - 4.3 Exploiting the Visual: Image Recognition for Augmented Reality
5. Detection and Sensing
  - 5.1 Sensor Construction and Techniques
  - 5.2 Intelligent Agents and Surveillance
  - 5.3 Managing the Complex: Sensor Networks in Intelligent Transportation Systems
6. Problem-solving
  - 6.1 Knowledge Sharing and the Cloud
  - 6.2 Rule-based Systems
  - 6.3 Learning from Nature: Expert Systems in Business
7. Decision Support
  - 7.1 Invariants, Determinants, and Alternatives in Decision-making
  - 7.2 Correlation and Causality in Strategic Decision-making
  - 7.3 Approaching the Crossroads: Dashboards and Visualization
8. Data Security and Data Protection
  - 8.1 Securing Data Storage and Processing Infrastructure Against Unauthorized Access
  - 8.2 Compliance and Regulations, GDPR

### Literature

#### Compulsory Reading

#### Further Reading

- Bajcsy, P., Chalfoun, J., & Simon, M. (2017). Web microanalysis of big image data. Berlin:Springer. (Database: ProQuest).
- Delen, D. (2015). Real-world data mining: Applied business analytics and decision making. NewYork, NY: Pearson.
- Farzindar, A., Inkpen, D., & Hirst, G. (2017). Natural language processing for social media (2nd ed.).San Rafael, CA: Morgan & Claypool Publishers. (Database: ProQuest).
- Hsu, H., Chang, C., & Hsu, C. (Eds.). (2017). Big data analytics for sensor-network collectedintelligence. Cambridge, MA: Academic Press. (Database: ProQuest).
- Pearl, J., & Mackenzie, D. (2018). The book of why: The new science of cause and effect. New York,NY: Basic Books.

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## Blockchain and Quantum Computing

Module Code: DLMCSEBCQC

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	None	MA	10	300 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimaldauer: 1 Semester	WiSe/SoSe	English

### Module Coordinator

Enno Nagel (Blockchain) / Sydney Otten (Quantum Computing)

### Contributing Courses to Module

- Blockchain (DLMCSEBCQC01)
- Quantum Computing (DLMCSEBCQC02)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Blockchain

- Study Format "Distance Learning": Written Assessment: Written Assignment
- Study Format "myStudies": *Type of examination*

##### Quantum Computing

- Study Format "myStudies": *Type of examination*
- Study Format "Distance Learning": Oral Assignment

### Weight of Module

see curriculum

### Module Contents

#### Blockchain

- Basic concepts of blockchain and related technologies
- Applications of blockchain and DLT
- Security
- Development of blockchain and DLT applications
- Social and legal aspects

#### Quantum Computing

- Physics of quantum computing
- Quantum computing models
- Quantum algorithms
- Quantum computing with the IBM framework Qiskit
- Applications, potential for and challenges of quantum computing

### Learning Outcomes

#### Blockchain

On successful completion, students will be able to

- outline the functions provided by and the technology used in blockchains.
- explain important applications of block chains, in particular BitCoin.
- demonstrate the technical architecture of blockchain applications.
- appraise the benefits and challenges of suggested blockchain applications.
- discuss the social and legal aspects of blockchain technology.

#### Quantum Computing

On successful completion, students will be able to

- outline the basic concepts of quantum mechanics as they relate to quantum computing.
- describe the computation models used in quantum computing.
- demonstrate the role of quantum computing for cryptography and other application areas.
- compare the theoretical and practical potential of quantum computing to classical computing.
- apply the concepts of quantum computing to develop simple programs within the Qiskit framework.

#### Links to other Modules within the Study Program

This module is similar to other modules in the field of Computer Science & Software Development.

#### Links to other Study Programs of the University

All Bachelor Programmes in the IT & Technology field.

# Blockchain

Course Code: DLMCSEBCQC01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	None

## Course Description

Started by the cryptocurrency BitCoin, blockchain and related topics such as distributed ledger technologies and smart contracts have become increasingly important over the last few years and are claimed to be a major disruptive technologies. As BitCoin shows, systems that today need a trustworthy central coordinating body may become genuinely distributed systems without the need for such a body in the future. While blockchain has the potential for completely new types of applications, these suggested applications do not always make use of the strengths of the technology; rather, they simply provide a different approach to solving problems that could be solved more easily and efficiently using standard technologies such as database systems. Furthermore, blockchain applications have led to new social challenges and legal questions, such as the legal status of “smart contracts”. Different infrastructures such as Ethereum and Hyperledger have been developed to form the basis for blockchain applications. The goal of this course is to provide an understanding of the technical, as well as social and legal, aspects of blockchain and related technologies.

## Course Outcomes

On successful completion, students will be able to

- outline the functions provided by and the technology used in blockchains.
- explain important applications of block chains, in particular BitCoin.
- demonstrate the technical architecture of blockchain applications.
- appraise the benefits and challenges of suggested blockchain applications.
- discuss the social and legal aspects of blockchain technology.

## Contents

1. Basic Concepts
  - 1.1 The Functional View: Distributed Ledger Technologies
  - 1.2 The Technical View: Blockchain
  - 1.3 History of Blockchain and DLT
  - 1.4 Consensus Mechanisms
2. BitCoin
  - 2.1 The BitCoin Payment System
  - 2.2 The Technology Behind BitCoin

- 2.3 Security of BitCoin
- 2.4 Scalability and Other Limitations of BitCoin
- 2.5 BitCoin Derivatives and Alternatives
3. Smart Contracts and Decentralized Apps
  - 3.1 Smart Contracts
  - 3.2 Decentralized Apps (DApps)
  - 3.3 Ethereum
  - 3.4 Hyperledger
  - 3.5 Alternative Platforms for Smart Contracts and DApps
4. Security of Block Chain and DLT
  - 4.1 Cryptology Used
  - 4.2 Attacks on Blockchain and DLT
  - 4.3 Resolving Bugs and Security Holes
  - 4.4 Long-Term Security
5. Block Chain and DLT Application Scenarios
  - 5.1 Benefits and Limits of Applying Blockchain and DLT
  - 5.2 Registers for Land and Other Property
  - 5.3 Applications in the Supply Chain
  - 5.4 Applications in Insurance
  - 5.5 Initial Coin Offerings for Sourcing Capital
  - 5.6 Examples of Further Applications
6. Development of Blockchain and DLT Applications
  - 6.1 Architecture of Blockchain and DLT Applications
  - 6.2 Platform Selection
  - 6.3 Design of Blockchain and DLT Applications
7. Blockchain and Society
  - 7.1 (Mis-)Trust in Institutions
  - 7.2 Blockchain and the Environment
  - 7.3 Cyber-Currencies in the Darknet
  - 7.4 ICO Fraud
8. Legal Aspects
  - 8.1 DLT and Smart Contracts as Legal Contracts
  - 8.2 Cryptocurrencies as Legal Currencies

8.3 Regulation of ICOs

8.4 Data Protection / Privacy in Blockchains

## Literature

### Compulsory Reading

#### Further Reading

- De Filippi, P., & Wright, A. (2018). Blockchain and the law. The rule of code. Cambridge, MA: Harvard University Press.
- Meinel, C., Gayvoronskaya, T. & Schnjakin, M. (2018). Blockchain. Hype or innovation. Potsdam: Universitätsverlag Potsdam.
- Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system [white paper]. Retrieved from <https://bitcoin.org/bitcoin.pdf>
- Tapscott, D., & Tapscott, N. (2018). Blockchain revolution. How the technology behind bitcoin is changing money, business, and the world. New York, NY: Portfolio/Penguin.
- Xu, W., Weber, I., & Staples, M. (2019). Architecture for blockchain applications. Cham: Springer.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b>
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>

# Quantum Computing

Course Code: DLMCSEBCQC02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

Quantum computing is a completely new paradigm for the architecture of computers. It currently is in the early stage of development but has the potential to speed up certain kinds of computations, not just by orders of magnitude but by moving them from exponential to linear growth. One of the issues that will be affected is the prime factorization of large numbers which currently forms the basis for important cryptographic algorithms, in particular the RSA algorithm which would in that case would no longer be secure. This course gives an introduction to the physics behind quantum computing and the computation models used. Students are familiarized with the most important algorithms for quantum computing and write a few programs for quantum computers. The application potential and challenges of quantum computing are also discussed.

## Course Outcomes

On successful completion, students will be able to

- outline the basic concepts of quantum mechanics as they relate to quantum computing.
- describe the computation models used in quantum computing.
- demonstrate the role of quantum computing for cryptography and other application areas.
- compare the theoretical and practical potential of quantum computing to classical computing.
- apply the concepts of quantum computing to develop simple programs within the Qiskit framework.

## Contents

1. Basic concepts
  - 1.1 Quantum physics as a basis for computing
  - 1.2 Types of quantum computers
  - 1.3 Qbits
  - 1.4 Linear algebra
2. The physics of quantum computers
  - 2.1 Basic concepts of quantum mechanics
  - 2.2 Spin and entanglement
  - 2.3 Architecture of quantum computers

- 2.4 Noise and error correction
- 2.5 Current state and outlook
3. Quantum computing models
  - 3.1 Quantum gates and circuits
  - 3.2 Single qubit quantum systems
  - 3.3 Multiple qubit quantum systems
4. Quantum algorithms
  - 4.1 Computability and complexity in quantum computing
  - 4.2 Quantum Fourier transform
  - 4.3 The Shor algorithm
  - 4.4 The Grover algorithm
5. Quantum computing with the IBM framework Qiskit
  - 5.1 Overview of Qiskit and the IBM Q Provider
  - 5.2 Quantum circuits in Qiskit
  - 5.3 First steps in programming with Qiskit
6. Applications, potential and challenges of quantum computing
  - 6.1 Applications of quantum computing
  - 6.2 Quantum cryptography and post-quantum cryptography
  - 6.3 Quantum supremacy

**Literature****Compulsory Reading****Further Reading**

- Mermin, N. D. (2007). Quantum computer science: An introduction. Cambridge University Press.
- Nielsen, M. A., & Chuang, I. L. (2000). Quantum computation and quantum information. Cambridge University Press.
- Rieffel, E. G., & Polak, W. H. (2011). Quantum computing: A gentle introduction. MIT Press.

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b>
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

## Change Management in Organizations

Module Code: DLMITECMO

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Zeljko Sevic (Tools in Organizational Analysis) / Prof. Dr. Sonja Würtemberger (Change Management)

### Contributing Courses to Module

- Tools in Organizational Analysis (DLMWPWOAE01\_E)
- Change Management (DLMBCM01)

### Module Exam Type

#### Module Exam

#### Split Exam

Tools in Organizational Analysis

- Study Format "Distance Learning": Exam, 90 Minutes

Change Management

- Study Format "Distance Learning": Written Assessment: Case Study

### Weight of Module

see curriculum

**Module Contents****Tools in Organizational Analysis**

- The Organization
- Organizational Research
- Organization Diagnostics
- Organization Analysis
- Practical application in specific areas

**Change Management**

- The context and meaning of change
- The change process
- Perspectives for understanding change
- Implementing change



### Learning Outcomes

#### Tools in Organizational Analysis

On successful completion, students will be able to

- deal with the concept of organization in a differentiated way.
- evaluate the possibilities of organizational diagnostics.
- use selected instruments of organizational and team diagnosis.
- carry out, evaluate and reflect on organizational diagnostic measures.
- work on specific organizational analyses.

#### Change Management

On successful completion, students will be able to

- recognize common features of organizational change and anticipate some of the standard difficulties encountered when an organization engages in change processes.
- explain the importance of organizational change.
- develop a conceptual framework for planned and improvised organizational change, and differentiate between anticipated, emergent, and opportunity-based change.
- utilize and redesign formal organizational structures to facilitate change processes.
- recognize the role of informal organizational structures and identify key stakeholders to promote change processes.
- analyze the social networks that exist within an organization, map independencies and motives/interests, and plan how to distribute information and redesign work flows.
- differentiate between groups of stakeholders and identify the most suitable strategy to adopt with each group.
- recognize the role of the change leader as a political broker and build social capital through informal methods.
- utilize stories and symbols when communicating with others in an organization to maximize leverage as a cultural change leader.
- draw on empirical evidence to plan and implement change processes in an organization.

#### Links to other Modules within the Study Program

This module is similar to other modules in the fields of Business Administration & Management

#### Links to other Study Programs of the University

All Master Programmes in the Business & Management fields

## Tools in Organizational Analysis

Course Code: DLMWPWOAE01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Organizations are more than ever like living organisms, which due to external changes must also change internally and adapt to new conditions. This course deals with a differentiated view of entrepreneurially oriented organizations, their goals, possible strategies, their function and performance. It sheds light on the possibilities of organizational research and its fields of research, in order to then address the goals, possibilities and fields of application of the diagnosis of organizations. Various methods and instruments of organizational diagnosis are presented with the aim of using them in the organizational analysis process. This enables students to initiate and implement change measures on the basis of diagnostic instruments and to evaluate such measures. The course also deals with the practical application of topics that arise in everyday business life, such as the analysis of change management processes, of careers and in connection with risk assessment in the acquisition of companies or company investments (due diligence). In this way, students are taught the spectrum and possible applications of the measures and methods of a targeted organizational analysis through diagnostic measures.

### Course Outcomes

On successful completion, students will be able to

- deal with the concept of organization in a differentiated way.
- evaluate the possibilities of organizational diagnostics.
- use selected instruments of organizational and team diagnosis.
- carry out, evaluate and reflect on organizational diagnostic measures.
- work on specific organizational analyses.

### Contents

1. The Organization
  - 1.1 The concept of organization
  - 1.2 Goals and strategies of an organization
  - 1.3 Function and performance of organizations
  - 1.4 Role of people in organizations
  - 1.5 Differences between organizations
2. Organizational Research
  - 2.1 Perspectives of organizational research

- 2.2 Fields of research
- 2.3 Empirical research on organizations
3. Organization Diagnostics
  - 3.1 Definition and goals of organizational diagnostics
  - 3.2 Fields of application of surgical diagnostics
  - 3.3 The Organizational Diagnosis as a Management Tool
  - 3.4 Target groups of organizational diagnostic findings
  - 3.5 Selected instruments of team and organization diagnosis
4. Organization Analysis
  - 4.1 The organizational analysis
  - 4.2 Preliminary considerations and analysis process
  - 4.3 Conception and operationalization
  - 4.4 Data collection methods
  - 4.5 Survey and evaluation
  - 4.6 Presentation of the analysis and reflection
5. Practical application in specific areas
  - 5.1 Analysis of change processes
  - 5.2 Network analysis
  - 5.3 Analysis of careers in organizations
  - 5.4 Organizational Analysis and Due Diligence

**Literature****Compulsory Reading****Further Reading**

- Harris, O. J., & Hartman, S. J. (2002). *Organizational behavior*. Taylor & Francis.
- Luthans, F. (2015). *Organizational behavior: An evidence-based approach* (13th ed.). InformationAge Publishing.
- Stroh, L. K., Northcraft, G. B., Neale, M. A., Kern, M., Langlands, C., & Greenberg, J. (2003). *Organizational behavior: A management challenge* (2nd ed.). Psychology Press.
- Tolbert, P. S. (2016). *Organizations structures, processes, and outcomes* (10th ed.). Routledge.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

# Change Management

Course Code: DLMBCM01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

We live in a world characterized by constant change. This affects not only individuals but also organizations. Even successful organizations need to constantly reinvent themselves in order to remain successful. This course presents a discussion of change in relation to the complexities of organizational life, with an emphasis on applying theory to actual practice. Organizational change is an international phenomenon and the course includes many international case examples. With a focus on organizational change as opposed to personal change and/or entrepreneurship, this course has a distinctly different focus from the related modules “Leadership” and “Innovation and Entrepreneurship.” The first part of the course considers the nature of change and different change models. The second part focuses on how different perspectives complement one another and can be used to better understand, analyze, and diagnose change processes. The course deals with issues of structure, culture, and politics. In the later part of the course, the implementation of change is considered in detail. Given that many change processes fail, this part is an important learning component to complement an in-depth understanding of change.

## Course Outcomes

On successful completion, students will be able to

- recognize common features of organizational change and anticipate some of the standard difficulties encountered when an organization engages in change processes.
- explain the importance of organizational change.
- develop a conceptual framework for planned and improvised organizational change, and differentiate between anticipated, emergent, and opportunity-based change.
- utilize and redesign formal organizational structures to facilitate change processes.
- recognize the role of informal organizational structures and identify key stakeholders to promote change processes.
- analyze the social networks that exist within an organization, map independencies and motives/interests, and plan how to distribute information and redesign work flows.
- differentiate between groups of stakeholders and identify the most suitable strategy to adopt with each group.
- recognize the role of the change leader as a political broker and build social capital through informal methods.
- utilize stories and symbols when communicating with others in an organization to maximize leverage as a cultural change leader.
- draw on empirical evidence to plan and implement change processes in an organization.

**Contents**

1. Organizational Change
  - 1.1 What is Organizational Change About?
  - 1.2 Organizational Change is Ubiquitous
  - 1.3 Change is Difficult
  
2. Change Management
  - 2.1 The Context of Organizational Change
  - 2.2 Planned Versus Improvisational Change Management
  - 2.3 The Congruence Model of Change
  
3. Designing Structure
  - 3.1 Formal Structure in Organizations
  - 3.2 Grouping
  - 3.3 Linking
  - 3.4 The Change Leader as an Architect
  
4. Social Networks
  - 4.1 What are Social Networks?
  - 4.2 Key Terms of Social Network Analysis
  - 4.3 Unique Characteristics of Social Networks
  - 4.4 Social Networks and Organizational Change
  
5. Politics
  - 5.1 Organizations as Political Arena
  - 5.2 Politics and Change
  - 5.3 The Importance of a Political Perspective on Change
  
6. Sense-Making
  - 6.1 Organizational Culture
  - 6.2 Sense-Making in Organizations
  - 6.3 The Change Leader as Shaman
  
7. Change Implementation
  - 7.1 How to Implement Change Successfully
  - 7.2 Four Perspectives on Change

**Literature****Compulsory Reading****Further Reading**

- Bolman, L. G., & Deal, T. E. (2013). Reframing organizations: Artistry, choice, and leadership (5th ed.). San Francisco, CA: Jossey-Bass.
- Cameron, K. S., & Quinn, R. E. (2011). Diagnosing and changing organizational culture: Based on the competing values framework (3rd ed.). San Francisco, CA: Jossey-Bass.
- Pentland, A. (2014). Social physics: How good ideas spread – The lessons from a new science. New York, NY: Penguin Press.
- McChrystal, S., Collins, T., Silverman, D., & Fussell, C. (2015). Team of teams: New rules of engagement for a complex world. New York, NY: Penguin Press.
- Worren, N. A. M. (2012). Organisation design: Re-defining complex systems. Harlow: Pearson.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Case Study

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline



# Cloud Computing

Module Code: DLMWIWCC\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> <ul style="list-style-type: none"> <li>▪ DLMWIWCC01_E</li> <li>▪ none</li> </ul>	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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## Module Coordinator

Prof. Dr. Andrew Adjah Sai (Introduction to Cloud Computing and Serverless Computing) / Prof. Dr. Andrew Adjah Sai (Project: Cloud Computing)

## Contributing Courses to Module

- Introduction to Cloud Computing and Serverless Computing (DLMWIWCC01\_E)
- Project: Cloud Computing (DLMWIWCC02\_E)

## Module Exam Type

<b>Module Exam</b>	<b>Split Exam</b> <u>Introduction to Cloud Computing and Serverless Computing</u> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Exam, 90 Minutes</li> </ul> <u>Project: Cloud Computing</u> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Written Assessment: Project Report</li> </ul>
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## Weight of Module

see curriculum

<p><b>Module Contents</b></p> <p><b>Introduction to Cloud Computing and Serverless Computing</b></p> <ul style="list-style-type: none"> <li>▪ Cloud Computing Basics</li> <li>▪ Service and Deployment Models for Cloud Computing</li> <li>▪ Security and Privacy in the Cloud</li> <li>▪ Cloud Computing Provider</li> <li>▪ Typical Business Applications in the Cloud</li> </ul> <p><b>Project: Cloud Computing</b></p> <p>Identification of a use case, ideation, design and development of a custom cloud application, that runs on a cloud provider such as Amazon AWS or Microsoft Azure.</p>	
<p><b>Learning Outcomes</b></p> <p><b>Introduction to Cloud Computing and Serverless Computing</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ know and understand definitions and categorizations of cloud computing,</li> <li>▪ describe the underlying technologies that enable cloud computing,</li> <li>▪ explain and evaluate service models of the cloud,</li> <li>▪ understand and assess security risks of cloud solutions for enterprises,</li> <li>▪ differentiate between cloud providers on the market and compare their services,</li> <li>▪ evaluate business applications in the cloud.</li> </ul> <p><b>Project: Cloud Computing</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ plan, implement and document a cloud based development project,</li> <li>▪ identify a suitable cloud service provider and assess their available services for deployment of a recipe-based cloud architecture,</li> <li>▪ identify and evaluate typical problems in different project phases of cloud solution development by using appropriate methods,</li> <li>▪ answer and evaluate business-relevant questions for evaluating a cloud solution.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the field of Computer Science &amp; Software Development</p>	<p><b>Links to other Study Programs of the University</b></p> <p>All Master Programs in the IT &amp; Technology field</p>

# Introduction to Cloud Computing and Serverless Computing

Course Code: DLMWIWCC01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

Cloud computing stands for technical services, software products and infrastructures that can be called up at any time and are provided decentrally via the Internet. They cover the increasing requirements of the digital corporate world with scalable and flexible solutions. The aim of this course is therefore to teach basic concepts as well as service and deployment models of cloud computing. The course enables students to identify and evaluate suitable use cases in the business world for cloud solutions. The course first reviews basic cloud computing terminology and classifications. Then it describes necessary technology that have made cloud computing possible. Afterwards, opportunities and risks of using cloud solutions are reflected and evaluated. Based on this, typical cloud service models are discussed and essential security concepts for cloud solutions are presented. After an overview of central players in the cloud market, typical use cases in the business world are shown. Additionally to the technical aspects, this course also provides a basic understanding of the use and usability of cloud solutions in the business environment.

## Course Outcomes

On successful completion, students will be able to

- know and understand definitions and categorizations of cloud computing,
- describe the underlying technologies that enable cloud computing,
- explain and evaluate service models of the cloud,
- understand and assess security risks of cloud solutions for enterprises,
- differentiate between cloud providers on the market and compare their services,
- evaluate business applications in the cloud.

## Contents

1. Cloud Technologies Basics
  - 1.1 Definition and Categories of Cloud Computing
  - 1.2 History and Evolution of Cloud Computing and its Technology
  - 1.3 Distinguishing Cloud Computing from related Concepts (Grid Computing, ASP, etc.)
  - 1.4 Opportunities and Risks of using Cloud Computing

2. Technologies enabling Cloud Computing
  - 2.1 Internet/Web 2.0
  - 2.2 Data Center
  - 2.3 Virtualization
  - 2.4 Containerization
3. Service Models in the Cloud
  - 3.1 Infrastructure as a Service (IaaS)
  - 3.2 Platform as a Service (PaaS)
  - 3.3 Software as a Service (SaaS)
  - 3.4 Function as a Service (FaaS).
4. Operation Models for Cloud Computing
  - 4.1 Public Cloud
  - 4.2 Private Cloud
  - 4.3 Community Cloud
  - 4.4 Hybrid Cloud
5. Cloud Security and Privacy
  - 5.1 Typical Security Risks of Applications, Interfaces and Data
  - 5.2 Best Practices for Cloud Encryption and Security Architecture
  - 5.3 Aspects of Data Protection
6. Cloud Provider
  - 6.1 Overview of the Global Market of Cloud Providers
  - 6.2 Provider Example of the "Big-4" (AWS, IBM, Google and Microsoft)
7. Business Use Cases and Application Examples
  - 7.1 Business Drivers for Cloud Computing
  - 7.2 Typical Application Examples (Data Analytics, ERP Solutions, IOT, Blockchain, and others)

**Literature****Compulsory Reading****Further Reading**

- Chang, V., Walters, R. J. & Wills, G. (2015). Delivery and adoption of cloud computing services in contemporary organizations. IGI Global.
- Freeman, E. & Harvey, N. (2020). 97 things every cloud engineer should know. O'Reilly Media.
- Longbottom, C. (2017). Evolution of cloud computing: How to plan for change. BCS The Chartered Institute for IT.
- Ramachandran, M. (2016). Software security requirements management as an emerging cloud computing service. *International Journal of Information Management*, 36(4),580–590.
- Vacca, J. R. (2017). Cloud computing security: Foundations and challenges. CRC Press.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## Project: Cloud Computing

Course Code: DLMWIWCC02\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	DLMWIWCC01_E

### Course Description

In a world of digital enterprises, cloud computing plays a crucial role in the design of modern, scalable and flexible enterprise solutions. The potential is huge: Moving the company's own infrastructure to the cloud, hosting complex platform and software solutions in the cloud or provide simple and cost-effective services using serverless architectures are some examples of applied Cloud Computing. The aim of this course is to identify a real life use case for cloud computing in the context of an organization and to develop an appropriate cloud-based application prototype. The focus lays on the design and implementation using existing cloud service providers. Furthermore business-critical issues, such as feasibility, scalability, security and costs, are also to be evaluated and documented.

### Course Outcomes

On successful completion, students will be able to

- plan, implement and document a cloud based development project,
- identify a suitable cloud service provider and assess their available services for deployment of a recipe-based cloud architecture,
- identify and evaluate typical problems in different project phases of cloud solution development by using appropriate methods,
- answer and evaluate business-relevant questions for evaluating a cloud solution.

### Contents

- In the Project: Cloud Computing, students will demonstrate the knowledge, skills and competencies to identify, design and develop a cloud-based application prototype for a virtual enterprise. Students will develop ideas and proposals for a solution based on a given problem or an independently identified problem. Based on the selection of a suitable provider, such as Amazon AWS, a specification and design of a proof-of-concept solution is developed and documented. The documentation also considers the evaluation of aspects such as security and scalability.

**Literature****Compulsory Reading****Further Reading**

- o. V. (o. J.): AWS Documentation. (URL: <https://docs.aws.amazon.com/index.html> [last accessed: 22.05.2020])
- Wadia, Y. et al. (2019): Implementing AWS: Design, Build, and Manage your Infrastructure. Packt Publishing Ltd., Birmingham UK.
- Zalazar A.S./Ballejos L./Rodriguez S. (2017): Analyzing Requirements Engineering for Cloud Computing. In: Ramachandran M./Mahmood Z. (ed.): Requirements Engineering for Service and Cloud Computing. Springer, Cham.
- Zardari, S./Faniyi, F./Bahsoon R. (2013): Cloud-Based Goal Oriented Requirements Engineering. In: Mistrík, I. et. al. (ed.): Aligning Enterprise, System, and Software Architectures. IGI Global, Hershey PA.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Communication and Negotiation

Module Code: DLMITECN

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	MA	10	300 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimum 1 semester	WiSe/SoSe	English

### Module Coordinator

Prof. Dr. Caroline Trautwein (Conversation Management and Communication Techniques) / Prof. Dr. Georg Berkel (Negotiation)

### Contributing Courses to Module

- Conversation Management and Communication Techniques (DLMWPGUK01\_E)
- Negotiation (DLMNEGE01-01)

### Module Exam Type

Module Exam	Split Exam
	<p><u>Conversation Management and Communication Techniques</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Oral Assignment</li> </ul> <p><u>Negotiation</u></p> <ul style="list-style-type: none"> <li>• Study Format "myStudies": Oral Assignment</li> <li>• Study Format "Distance Learning": Oral Assignment</li> </ul>

### Weight of Module

see curriculum

**Module Contents****Conversation Management and Communication Techniques**

- Forms of Communication
- Means of Communication Techniques of Communication
- Communication with Specific Groups Conversation Management
- Means in Conversation
- Dealing with Difficult Conversation Situations

**Negotiation**

- The significance and nature of negotiation
- The distribution of value
- Distributive negotiation tactics
- The creation of value
- Value creation negotiation tactics
- The negotiator's dilemma
- Learning to negotiate

### Learning Outcomes

#### Conversation Management and Communication Techniques

On successful completion, students will be able to

- place the importance of the areas of communication techniques and interviewing in the overall context of business psychology,
- identify goals and forms of communication and interviewing in the context of business psychology,
- use and apply means, methods and instruments of communication and conversation in the context of business psychology,
- identify and understand purposeful communication and conversation management techniques against the backdrop of difficult and deadlocked situations,
- explain and develop appropriate measures of communication and conversation,
- discuss and uncover problems of communication and conversation and suggest alternative approaches.

#### Negotiation

On successful completion, students will be able to

- Describe the process of negotiation and the interconnected but opposing processes of value distribution and value creation.
- Recognize common myths and misconceptions regarding negotiation and negotiators and take measures to avoid common pitfalls.
- Apply empirical insights about the process of negotiation to negotiation scenarios.
- Negotiate with various other parties using value distribution and value creation tactics.
- Engage in a process of self-reflection and utilize a variety of tools to improve performance as a novice negotiator.

#### Links to other Modules within the Study Program

This module is similar to other modules in the fields of Social Work and Business Administration & Management

#### Links to other Study Programs of the University

All Master Programmes in the Social Sciences and Business & Management fields

## Conversation Management and Communication Techniques

Course Code: DLMWPGUK01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Good communication skills are the key to professional success. To achieve professional goals, you have to be convincing in conversations. Only those who really understand their conversation partners and are also understood by them, will achieve a good result more quickly. To achieve this, it is essential to be prepared, especially for difficult conversations, and to have a toolbox of different conversation techniques at your disposal, so that can be used in a targeted manner to make constructive communication possible. In addition to certain means of communication, this also requires special techniques and methods. Knowledge and understanding of the psychological and human aspects of the use of communication techniques and the conduct of discussions are an important basis for the success of discussions in the context of business psychology. The course also addresses difficult and critical discussion situations as well as communication with specific target groups. Students learn about different communication styles, communication techniques as well as the phases of conducting discussions in order to specifically prepare for and conduct discussions with other team members as well as external partners. You will learn how to better adapt to your conversation partners and act accordingly in order to achieve good results for both sides.

### Course Outcomes

On successful completion, students will be able to

- place the importance of the areas of communication techniques and interviewing in the overall context of business psychology,
- identify goals and forms of communication and interviewing in the context of business psychology,
- use and apply means, methods and instruments of communication and conversation in the context of business psychology,
- identify and understand purposeful communication and conversation management techniques against the backdrop of difficult and deadlocked situations,
- explain and develop appropriate measures of communication and conversation,
- discuss and uncover problems of communication and conversation and suggest alternative approaches.

## Contents

1. Basics of Communication
  - 1.1 Defining and Characterizing Communication
  - 1.2 Modeling Communication
  - 1.3 Functions of Communication
  - 1.4 Communication Competence
2. Forms of Communication
  - 2.1 Types of Communication
  - 2.2 Modalities of Communication
  - 2.3 Verbal Communication
  - 2.4 Nonverbal Communication
3. Perception in the Communication Process
  - 3.1 Perception Process
  - 3.2 Perceiving Others
  - 3.3 Perceiving and Presenting Self
  - 3.4 Communicative Styles
4. Communication Techniques
  - 4.1 Listening
  - 4.2 Perspective Taking
  - 4.3 Questioning
  - 4.4 I-language
  - 4.5 Complete Messages
  - 4.6 Metacommunication
  - 4.7 Neuro Linguistic Programming Techniques
5. Communication at Work
  - 5.1 Communication in Dyads
  - 5.2 Communication in Teams
  - 5.3 Organizational Communication
  - 5.4 Communication with the Public
6. Conversation Strategies
  - 6.1 Shaping Relationships
  - 6.2 Handling Self-Disclosure
  - 6.3 Presenting Content

- 6.4 Employing Influence
- 6.5 Planning and Structuring Conversations
- 6.6 Problem-solving in groups
7. Difficult Conversations
  - 7.1 Conveying Difficult Content
  - 7.2 Difficult Interaction Partners
  - 7.3 Conflicts
  - 7.4 Feedback Rules
8. Public Communication
  - 8.1 Types
  - 8.2 Rhetorics
  - 8.3 Preparing
  - 8.4 Delivering
  - 8.5 The influence of social media

**Literature****Compulsory Reading****Further Reading**

- Adler, R. B., Rodman, G. R., & du Pré, A. (2017). *Understanding human communication* (13thed.). Oxford University Press.
- *Communication in the real world: An introduction to communication studies*. (2016). University of Minnesota Libraries Publishing.
- Hargie, O. (2017). *Skilled interpersonal communication: Research, theory and practice* (6thed.). Routledge.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline



# Negotiation

Course Code: DLMNEGE01-01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

The course enables students to learn about both the negotiation process and actually how to negotiate. In order to understand the rules that govern the interpersonal decision-making process that is negotiation, it is essential to have an in-depth understanding of the two sides of negotiation: the distribution of value and the creation of value. This course begins by introducing students to the pervasive nature of negotiation and some of the common myths and misconceptions that limit the potential benefits that can be gained through effective negotiation. It then delves into the concept of distribution value and the specific tactics that can be employed in order to arrive at the most favorable outcome. Students will then explore value creation and how to implement tactics to move from a win-lose scenario to a win-win. The course will then offer insights drawn from game theory (including the prisoner's dilemma, the "stag hunt game," the "tit-for-tat" strategy) before concluding with a focused exploration of how to manage the process of implementing negotiation theory in practice, avoiding pitfalls and allowing for effective negotiation learning.

## Course Outcomes

On successful completion, students will be able to

- Describe the process of negotiation and the interconnected but opposing processes of value distribution and value creation.
- Recognize common myths and misconceptions regarding negotiation and negotiators and take measures to avoid common pitfalls.
- Apply empirical insights about the process of negotiation to negotiation scenarios.
- Negotiate with various other parties using value distribution and value creation tactics.
- Engage in a process of self-reflection and utilize a variety of tools to improve performance as a novice negotiator.

## Contents

1. The Significance and Nature of Negotiation
  - 1.1 The Nature and Types of Negotiation
  - 1.2 Misconceptions About Negotiation and Myths About Negotiators
2. The Distribution of Value
  - 2.1 The Pie: Zone of Possible Agreement

2.2	Slicing the Pie: Maximizing Distributive Outcomes
3.	Distributive Negotiation Tactics
3.1	Distributive Negotiation To-Dos
3.2	Learning Transfer
4.	The Creation of Value
4.1	Value Creation: From Win-Lose to Win-Win
4.2	The Four Steps and the Three Types of Value Creation
5.	Value Creation Negotiation Tactics
5.1	Framing
5.2	Value Creation Negotiation To-Dos
6.	The Negotiator's Dilemma
6.1	The Dilemma Between Creating and Distributing Value
6.2	The Prisoner's Dilemma as a Metaphor for the Negotiator's Dilemma
6.3	Coping Strategies: Tit-for-Tat Strategy and Changing Payoffs
7.	Learning to Negotiate
7.1	From Theory to Practice
7.2	Three Challenges to Learning to Negotiate
7.3	A Model for Negotiation Learning

<b>Literature</b>
<b>Compulsory Reading</b>
<b>Further Reading</b>
<ul style="list-style-type: none"><li>▪ Brett, J. M. (2014). <i>Negotiating globally: How to negotiate deals, resolve disputes, and make decisions across cultural boundaries</i> (3rd ed.). Jossey-Bass.</li><li>▪ Fisher, R., Ury, W. L., &amp; Patton, B. (2011). <i>Getting to yes: Negotiating agreements without giving in</i> (3rd ed.). Penguin Books.</li></ul>

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

## Cyber Criminality

Module Code: DLMIMWCK\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> <ul style="list-style-type: none"> <li>▪ none</li> <li>▪ DLMIMWCK01_E</li> </ul>	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Alexander Lawall (Attack Scenarios and Incident Response) / Prof. Dr. Alexander Lawall (Project: Cyber Forensics)

### Contributing Courses to Module

- Attack Scenarios and Incident Response (DLMIMWCK01\_E)
- Project: Cyber Forensics (DLMIMWCK02\_E)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Attack Scenarios and Incident Response

- Study Format "Distance Learning": Exam, 90 Minutes

##### Project: Cyber Forensics

- Study Format "Distance Learning": Portfolio

### Weight of Module

see curriculum

<p><b>Module Contents</b></p> <p><b>Attack Scenarios and Incident Response</b></p> <ul style="list-style-type: none"> <li>▪ Threat scenarios</li> <li>▪ attack vectors</li> <li>▪ Preventive measures</li> <li>▪ Reactive measures</li> <li>▪ Current situation of IT security</li> </ul> <p><b>Project: Cyber Forensics</b></p> <p>The project is concerned with the question of which procedure is suitable to react to computer-criminal incidents in a company. It deals with forensic procedures for the collection of evidence that can be used in court as well as recommendations for risk minimization, communication and prevention of such incidents. A current list of topics can be found in the Learning Management System.</p>	
<p><b>Learning Outcomes</b></p> <p><b>Attack Scenarios and Incident Response</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ assess threat scenarios and their effects.</li> <li>▪ name attack vectors and select adequate countermeasures.</li> <li>▪ apply electronic evidence procedures to selected attack scenarios.</li> <li>▪ develop preventive measures.</li> <li>▪ identify reactive measures and assess their effectiveness.</li> <li>▪ collect and evaluate information on the current threat situation.</li> </ul> <p><b>Project: Cyber Forensics</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ name basic methods and techniques of computer forensics and their limitations.</li> <li>▪ identify the systems and business processes affected by a computer crime and carry out a risk assessment.</li> <li>▪ recommend measures to secure electronic evidence and evaluate its usability in court.</li> <li>▪ develop recommendations for incident communication, response and prevention.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the fields of Computer Science &amp; Software Development</p>	<p><b>Links to other Study Programs of the University</b></p> <p>All Master Programs in the IT &amp; Technology fields</p>

# Attack Scenarios and Incident Response

Course Code: DLMIMWCK01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

This course provides students with knowledge for identification and action planning in dealing with criminal offences in the digital environment. It describes how weaknesses in hardware and software and their application can be exploited for criminal activities. In addition, the course introduces typical threat scenarios and the ways in which attacking systems can penetrate a computer system. The course also introduces methods of electronic evidence and shows how legally usable information can be obtained in case of an attack. This is followed by a discussion of the development of preventive measures and the possibilities for reacting in the event of a concrete threat. The course concludes with a discussion of how information on the current security situation can be obtained from reports by security authorities (such as BSI, Europol, NCA, FBI).

## Course Outcomes

On successful completion, students will be able to

- assess threat scenarios and their effects.
- name attack vectors and select adequate countermeasures.
- apply electronic evidence procedures to selected attack scenarios.
- develop preventive measures.
- identify reactive measures and assess their effectiveness.
- collect and evaluate information on the current threat situation.

## Contents

1. Introduction
  - 1.1 Computer crime as distinct from other offences
  - 1.2 Vulnerabilities in computers and mobile devices
  - 1.3 An overview of malware
  - 1.4 Social engineering and the human factor
2. Criminal basis
  - 2.1 Identity abuse
  - 2.2 Theft of intellectual property
  - 2.3 Falsification of evidentiary data
  - 2.4 Computer fraud

3. Specific offences
  - 3.1 Data Theft
  - 3.2 Digital blackmailing
  - 3.3 Computer sabotage
  - 3.4 Industrial espionage
4. Attack vectors
  - 4.1 Attacks on Chip and Firmware Level
  - 4.2 Attacks at operating system level
  - 4.3 Attacks at network and server level
  - 4.4 Attacks at application level
  - 4.5 Attacks at the organizational level
5. IT forensics and electronic evidence
  - 5.1 Identification, localization and handling of polymorphisms
  - 5.2 Detection mechanisms
  - 5.3 Finding electronic evidence
  - 5.4 Data recovery and evidence recovery
  - 5.5 Legal limits and predictive policing
6. Preventive measures
  - 6.1 Measures on hardware level
  - 6.2 Access permission, authorization and authentication
  - 6.3 Awareness & Training
  - 6.4 Incident Response Planning
7. Reactive measures
  - 7.1 Initial assessment and extent of damage
  - 7.2 Prevention of persistent damage
  - 7.3 Collection, exchange and distribution of information
  - 7.4 Cooperation with security authorities and cooperation partners
  - 7.5 Recommended actions for companies
8. The current security situation
  - 8.1 Current reports of the safety authorities
  - 8.2 Evaluation of the recommendations of the safety authorities
  - 8.3 Current topics of the Europol Awareness Campaign



**Literature****Compulsory Reading****Further Reading**

- Sherman, A. T., DeLatte, D., Neary, M., Oliva, L., Phatak, D., Scheponik, T., Herman, G. L., & Thompson, J. (2018). Cybersecurity: Exploring core concepts through six scenarios. *Cryptologia*, 42(4), 337–377.
- Breitinger, F., & Baggili, I. (2019). Digital Forensics and Cyber Crime: 10th International EAI Conference, ICDF2C 2018, New Orleans, LA, USA, September 10–12, 2018, Proceedings (1st ed.).
- Lewis, J., & Baker, S. (2013). The economic impact of cybercrime and cyber espionage. McAfee.
- Forshaw, J. (2018). *Attacking network protocols: A hacker's guide to capturing, analysis, and exploitation*. No Starch Press. Chapter 2.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## Project: Cyber Forensics

Course Code: DLMIMWCK02\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	DLMIMWCK01_E

### Course Description

This project aims to create an action plan for digital investigation and incident handling for a given threat scenario. Starting with a concrete suspicion of a computer-criminal act (e.g. a suspected server attack, loss of customer data or manipulation of business data) the students plan to conduct a digital investigation for electronic evidence and to secure evidence that can be used in court. The data obtained will be used to evaluate risks for affected business processes and to make recommendations for incident treatment and prevention.

### Course Outcomes

On successful completion, students will be able to

- name basic methods and techniques of computer forensics and their limitations.
- identify the systems and business processes affected by a computer crime and carry out a risk assessment.
- recommend measures to secure electronic evidence and evaluate its usability in court.
- develop recommendations for incident communication, response and prevention.

### Contents

- The project aims to develop an action plan for conducting a digital investigation and incident management for a given threat scenario. Beginning with the concrete suspicion of a computer crime\*, the students develop a plan of action that covers the following measures:
  - Localization of the affected systems (hardware and software)
  - Identification of the affected business processes
  - Risk assessment for the impact on affected business processes
  - Communication with internal departments, cooperation partners, customers and the public
  - Identification and preservation of relevant data
  - Examination of the data
  - Securing electronic evidence and its usability in court
  - Recommendations for prevention
  - The action plan should be written in such a way that it serves as a process template for continuous incident handling.

- Examples of suspicious cases are a suspected server attack, loss of customer data, manipulation of business data, publication of internal company data, suspicion of product piracy, inconsistency of electronic signatures in company documents, digital blackmailing of a decision maker or suspicion of industrial espionage.

## Literature

### Compulsory Reading

#### Further Reading

- ISO/IEC 27001 (2022): Information Security Management. Tech. rep.
- ISO/IEC 27001:2022.ISO/IEC 27002 (2022): Information Technology - Security Techniques - Code of Practice for Information Security Management. Tech. rep. ISO/IEC 27002:2022.
- NIST (2020): Security Controls for Federal Information Systems. Tech. rep. NIST SP-800-53 Rev. 5.
- CSA (Cloud Security Alliance) (2021): "Cloud Controls Matrix v4."
- CSA (Cloud Security Alliance): "The Consensus Assessments Initiative Questionnaire v4."
- Luna, J., Langenberg, R., Suri, N. (2012): "Benchmarking cloud security level agreements using quantitative policy trees.", Proc. of ACM Workshop on Cloud computing security workshop, pp. 103–112.
- NIST Cloud Computing Reference Architecture and Taxonomy Working Group (2008): "Performance and Measurements Guide for Information Technology." In: NIST 800-55 Revision 1.
- NIST Cloud Computing Reference Architecture and Taxonomy Working Group (2020): "Performance and Measurements Guide for Information Technology." In: NIST 800-55 Revision 2.
- NIST (2013): "Security Controls for Federal Information Systems." Tech. rep. NIST SP-800-53. 2013.
- CIS (2014): "Cloud Service Level Agreement Standardisation Guidelines." Tech. rep. C-SIG SLA 2014. European Commission, C-SIG SLA.
- Pannetrat, A. et al (2013): "D2.1 Security-Aware SLA Specification Language and Cloud Security Dependency model."

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Portfolio

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Data Science and Analytics

Module Code: DLMBDSA

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Ulrich Kerzel (Data Science) / Prof. Dr. Andrew Adjah Sai (Analytical Software and Frameworks)

### Contributing Courses to Module

- Data Science (DLMBDSA01)
- Analytical Software and Frameworks (DLMBDSA02)

### Module Exam Type

<b>Module Exam</b>	<b>Split Exam</b>
	<p><u>Data Science</u></p> <ul style="list-style-type: none"> <li>• Study Format "myStudies": Exam, 90 Minutes</li> <li>• Study Format "Distance Learning": Exam, 90 Minutes</li> </ul> <p><u>Analytical Software and Frameworks</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Written Assessment: Written Assignment</li> <li>• Study Format "myStudies": Written Assessment: Written Assignment</li> </ul>

### Weight of Module

see curriculum

**Module Contents****Data Science**

- Introduction to data science
- Use cases and performance evaluation
- Pre-processing of data
- Processing of data
- Selected mathematical techniques
- Selected artificial intelligence techniques

**Analytical Software and Frameworks**

- Introduction to analytical software and frameworks
- Data storage
- Statistical modeling
- Machine learning
- Cloud computing platforms
- Distributed computing
- Database technologies

**Learning Outcomes****Data Science**

On successful completion, students will be able to

- identify use cases and evaluate the performance of data-driven approaches.
- understand how domain specific knowledge for a particular application context is required to identify objectives and value propositions for data science use cases.
- appreciate the role and necessity for business-centric model evaluation apposite to the respective area of application.
- comprehend how data are pre-processed in preparation for analysis.
- develop typologies for data and ontologies for knowledge representation.
- decide for appropriate mathematical algorithms to utilize data analysis for a given task.
- understand the value, applicability, and limitations of artificial intelligence for data analysis.

**Analytical Software and Frameworks**

On successful completion, students will be able to

- comprehend how cloud computing and distributed computing support the field of data analytics.
- understand in-memory database technologies for real-time analytics.
- apply advanced statistics and machine learning solutions to solve data analysis problems.
- compare the capabilities and limitations of the presented software solutions.
- understand how to identify the right technological solution for a specific application domain.

<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the field of Data Science &amp; Artificial Intelligence</p>	<p><b>Links to other Study Programs of the University</b></p> <p>All Master Programmes in the IT &amp; Technology field</p>
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# Data Science

Course Code: DLMBDSA01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

The course provides the framework to create value from data. After an introduction the course covers how to identify suitable use cases and evaluate the performance of data-driven methods. In an interdisciplinary approach, the requirements from a specific application domain need to be understood and transferred to the technological understanding to identify the objectives and value proposition of a Data Science project. The course covers techniques for the technical processing of data and then introduces advanced mathematical techniques and selected methods from artificial intelligence that are used to analyze data and make predictions.

## Course Outcomes

On successful completion, students will be able to

- identify use cases and evaluate the performance of data-driven approaches.
- understand how domain specific knowledge for a particular application context is required to identify objectives and value propositions for data science use cases.
- appreciate the role and necessity for business-centric model evaluation apposite to the respective area of application.
- comprehend how data are pre-processed in preparation for analysis.
- develop typologies for data and ontologies for knowledge representation.
- decide for appropriate mathematical algorithms to utilize data analysis for a given task.
- understand the value, applicability, and limitations of artificial intelligence for data analysis.

## Contents

1. Introduction to Data Science
  - 1.1 Overview of Data Science
  - 1.2 Terms and Definitions
  - 1.3 Applications & Notable Examples
  - 1.4 Sources of Data
  - 1.5 Structured, Unstructured, Streaming
  - 1.6 Typical Data Sources and their Data Type
  - 1.7 The 4 V's of Data: Volume, Variety, Velocity, Veracity
  - 1.8 Introduction to Probability Theory
  - 1.9 What Are Probabilities and Probability Distributions

- 1.10 Introduction to Bayesian Statistics
- 1.11 Relation to Data Science: Prediction as a Probability
- 2. Use Cases and Performance Evaluation
  - 2.1 Identification of Use Cases for Data Science
  - 2.2 Identifying Data Science Use Cases
  - 2.3 From Prediction to Decision: Generating Value from Data Science
  - 2.4 Evaluation of Predictions
  - 2.5 Overview of Relevant Metrics
  - 2.6 Business-centric Evaluation: the Role of KPIs
  - 2.7 Cognitive Biases and Decision-making Fallacies
- 3. Pre-Processing of Data
  - 3.1 Transmission of Data
  - 3.2 Data Quality and Cleansing of Data
  - 3.3 Transformation of Data (Normalization, Aggregation)
  - 3.4 Reduction of Data Dimensionality
  - 3.5 Data Visualisation
- 4. Processing of Data
  - 4.1 Stages of Data Processing
  - 4.2 Methods and Types of Data Processing
  - 4.3 Output Formats of Processed Data
- 5. Selected Mathematical Techniques
  - 5.1 Linear Regression
  - 5.2 Principal Component Analysis
  - 5.3 Clustering
  - 5.4 Time-series Forecasting
  - 5.5 Overview of Further Approaches
- 6. Selected Artificial Intelligence Techniques
  - 6.1 Support Vector Machines
  - 6.2 Neural Networks and Deep Learning
  - 6.3 Feed-forward Networks
  - 6.4 Recurrent Networks and Memory Cells
  - 6.5 Convolutional Networks
  - 6.6 Reinforcement Learning

## 6.7 Overview of Further Approaches

### Literature

#### Compulsory Reading

#### Further Reading

- Akerar, R., & Sajja, P.S. (2016). Intelligent techniques for data science. Cham: Springer.
- Bruce, A., & Bruce, P. (2017). Practical statistics for data scientists: 50 essential concepts. Newton, MA: O'Reilly Publishers.
- Fawcett, T. & Provost, F. (2013). Data science for business: What you need to know about data mining and data-analytic thinking. Newton, MA: O'Reilly Media.
- Hodeghatta, U. R., & Nayak, U. (2017). Business analytics using R – A practical approach. Berkeley, CA: Apress Publishing. (Database: ProQuest).
- Liebowitz, J. (2014). Business analytics: An introduction. Boca Raton, FL: Auerbach Publications. (Available online).
- Runkler, T. A. (2012). Data analytics: Models and algorithms for intelligent data analysis. Wiesbaden: Springer Vieweg.
- Skiena, S. S. (2017). The data science design manual. Cham: Springer.

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

# Analytical Software and Frameworks

Course Code: DLMBDSA02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

Analytical Software and Frameworks provides insight into contemporary software and platforms solutions for data analytics in business. The course introduces relevant frameworks and software used in modern data science projects. Commercial and open-source for cloud computing, distributed computing and machine learning, as well as a commercial development platform for in-memory database analytics, are covered. Additional software solutions may be covered by the lecturer as convenient. In particular in the written assignment, students are required to apply their technological knowledge to a specific scenario which requires interdisciplinary thinking of how to merge the particularities of a given application domain with the technological options.

## Course Outcomes

On successful completion, students will be able to

- comprehend how cloud computing and distributed computing support the field of data analytics.
- understand in-memory database technologies for real-time analytics.
- apply advanced statistics and machine learning solutions to solve data analysis problems.
- compare the capabilities and limitations of the presented software solutions.
- understand how to identify the right technological solution for a specific application domain.

## Contents

1. Introduction
  - 1.1 Software Systems
  - 1.2 Frameworks
  - 1.3 Distributed Computing
  - 1.4 Databases and Data Warehousing
2. Data Storage
  - 2.1 Data Clustering
  - 2.2 Data Replication
  - 2.3 Data Indexing
  - 2.4 Data Warehousing
3. Statistical Modeling Frameworks

- 3.1 The R Project for Statistical Computing
- 3.2 The Python Ecosystem
4. Machine Learning & Artificial Intelligence
  - 4.1 Overview of Modern Machine Learning Frameworks
  - 4.2 Introduction to TensorFlow & Keras
5. Cloud Computing Platforms & On-Premise Solutions
  - 5.1 Advantages and Disadvantages of Cloud, On-premise, and Edge Solutions
  - 5.2 Overview of Cloud Computing Solutions
6. Distributed Computing
  - 6.1 Overview of Distributed Computing Approaches
  - 6.2 Overview of Streaming Approaches
  - 6.3 Other Solutions
7. Database Technologies
  - 7.1 Overview of Database Approaches
    - 7.1.1 Row-based versus Column-based
    - 7.1.2 In Memory DB
    - 7.1.3 Relational DB versus noSQL
    - 7.1.4 Timeseries DB
  - 7.2 Overview of Database Implementations

**Literature****Compulsory Reading****Further Reading**

- Konstantinos Domdouzis, Peter Lake, & Paul Crowther. (2021). Concise Guide to Databases: A Practical Introduction: Vol. Second edition Konstantinos Domdouzis, Peter Lake, Paul Crowther. Springer.
- Perkins, L., Redmond, E., & Wilson, J. R. (2018). Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement: Vol. Second edition. Pragmatic Bookshelf.
- Keith Gordon. (2022). Principles of Data Management: Facilitating Information Sharing: Vol. Third edition. BCS, The Chartered Institute for IT.
- Mahanti, R. (2019). Data quality: dimensions, measurement, strategy, management, and governance /. ASQ Quality Press.
- Avinash Navlani, Armando Fandango, & Ivan Idris. (2021). Python Data Analysis: Perform Data Collection, Data Processing, Wrangling, Visualization, and Model Building Using Python: Vol. Third edition. Packt Publishing.
- Gayathri Rajagopalan. (2021). A Python Data Analyst's Toolkit: Learn Python and Python-based Libraries with Applications in Data Analysis and Statistics. Apress.
- Latifian, A. (2022). How does cloud computing help businesses to manage big data issues. *Kybernetes*, 51(6), 1917–1948.
- Wolfram Wingerath, Norbert Ritter, & Felix Gessert. (2019). Real-Time & Stream Data Management: Push-Based Data in Research & Practice. Springer.
- Alka Jarvis, Jose Johnson, & Prakash Ananad. (2022). Successful Management of Cloud Computing and DevOps. ASQ Quality Press.
- Golightly, L., Chang, V., Xu, Q. A., Gao, X., & Liu, B. S. (2022). Adoption of cloud computing as innovation in the organization. *International Journal of Engineering Business Management*, 14, 1–17.
- J. Dinesh Peter, Amir H. Alavi, & Bahman Javadi. (2018). Advances in Big Data and Cloud Computing: Proceedings of ICBDC18 (Vol. 1st ed. 2019). Springer.
- Sharma, S., Chang, V., Tim, U. S., Wong, J., & Gadia, S. (2019). Cloud and IoT-based emerging services systems. *Cluster Computing*, 22(1), 71–91.
- Alejandro Vaisman, & Esteban Zimányi. (2022). Data Warehouse Systems: Design and Implementation: Vol. Second edition. Springer.
- Harsh Chawla, & Pankaj Khattar. (2020). Data Lake Analytics on Microsoft Azure: A Practitioner's Guide to Big Data Engineering: Vol. 1st ed. Apress.
- Andreas Meier, & Michael Kaufmann. (2019). SQL & NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management. Springer Vieweg.
- Lindsay, D., Gill, S. S., Smirnova, D., & Garraghan, P. (2021). The evolution of distributed computing systems: from fundamental to new frontiers. *Computing*, 103(8), 1859–1878.
- Rashmi Ranjan Rout, Soumya Kanti Ghosh, Prasanta K. Jana, Asis Kumar Tripathy, Jyoti Prakash Sahoo, & Kuan-Ching Li. (2022). Advances in Distributed Computing and Machine Learning: Proceedings of ICADCML 2022. Springer.
- Rehman, T. B. (2018). Cloud computing basics. Sterling, VA: Stylus Publishing, LLC.
- M. Tamer Özsu, & Patrick Valduriez. (2019). Principles of Distributed Database Systems. Springer.
- Cloud networking and storage. (2020). *CompTIA Cloud Essentials+ Study Guide*; Page 35-76.
- Robert Johansson. (2018). Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib. Apress.
- Ashwin Pajankar, & Aditya Joshi. (2022). Hands-on Machine Learning with Python: Implement Neural Network Solutions with Scikit-learn and PyTorch. Apress.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests

## International and Intercultural Management

Module Code: DLMITEIIM

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	MA	10	300 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimum 1 semester	WiSe/SoSe	English

### Module Coordinator

Prof. Dr. Andreas Herrmann (Managing Across Borders) / Prof. Dr. Stéphane Timmer (Intercultural Management)

### Contributing Courses to Module

- Managing Across Borders (DLMINTMAB01\_E)
- Intercultural Management (DLMINTIM01\_E)

### Module Exam Type

Module Exam	Split Exam
	<p><u>Managing Across Borders</u></p> <ul style="list-style-type: none"> <li>• Study Format "myStudies": Exam, 90 Minutes</li> <li>• Study Format "Distance Learning": Exam, 90 Minutes</li> </ul> <p><u>Intercultural Management</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Exam, 90 Minutes</li> <li>• Study Format "myStudies": Exam, 90 Minutes</li> </ul>

### Weight of Module

see curriculum

### **Module Contents**

#### **Managing Across Borders**

- International economic and business environment
- Globalization and international competitiveness
- International Trade
- International financial and capital markets
- International organizations and economic integration
- Current hot spots in the international economic and business environment

#### **Intercultural Management**

- Fundamentals and classification of intercultural management
- Role and importance of intercultural management for companies
- Diversity management in intercultural management
- Entrepreneurial aspects in decision-making for intercultural management
- Focal points of intercultural management
- Intercultural management in selected countries

## Learning Outcomes

### Managing Across Borders

On successful completion, students will be able to

- identify the main developments and trends in the global economic environment and use them as a basis for business decisions.
- demonstrate the development of globalization and world trade in the last decades.
- explain the causes and effects of protectionism on a country's economic development.
- understand the interrelationships of international financial and capital markets and assess them with regard to the handling of exchange rate risks.
- explain the importance of international organizations such as the World Trade Organization (WTO) or the International Monetary Fund (IMF) for global cooperation.
- form their own opinion on current issues of international economic policy.

### Intercultural Management

On successful completion, students will be able to

- recognize and classify intercultural management as an independent discipline in business administration.
- use important cultural theories and cultural dimensions as a basis for business decisions in an international context.
- analyze relevant core competencies of a company for successful intercultural management and apply them in concrete situations.
- identify and manage culture-specific influences on the strategy, marketing and human resources of internationally active companies.
- apply important aspects of intercultural management in leadership, communication and cooperation in international teams.
- demonstrate cultural sensitivity and deeper understanding of international cooperation with selected cultural regions (Germany, USA, China).

#### Links to other Modules within the Study Program

This module is similar to other modules in the fields of Business Administration & Management

#### Links to other Study Programs of the University

All Master Programs in the Business & Management fields

## Managing Across Borders

Course Code: DLMINTMAB01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

The interdependence of economies, markets and technologies has increased continuously over the past decades. In addition to the former three dominant economic areas of the USA, Europe and Japan, emerging markets have joined the group, which play an increasingly important role in world trade. Global networking creates both opportunities and risks for internationally active companies. In this course, students acquire a deeper understanding of global economic, political and technological interrelationships as a basis for strategic decisions of internationally operating companies. In addition to knowledge of international trade, international financial and capital markets, and international organizations, students will be able to form their own well-founded opinion on current developments and trends in the international economic and business environment by the end of this course.

### Course Outcomes

On successful completion, students will be able to

- identify the main developments and trends in the global economic environment and use them as a basis for business decisions.
- demonstrate the development of globalization and world trade in the last decades.
- explain the causes and effects of protectionism on a country's economic development.
- understand the interrelationships of international financial and capital markets and assess them with regard to the handling of exchange rate risks.
- explain the importance of international organizations such as the World Trade Organization (WTO) or the International Monetary Fund (IMF) for global cooperation.
- form their own opinion on current issues of international economic policy.

### Contents

1. International economic and business environment
  - 1.1 Economic environment
  - 1.2 Political environment
  - 1.3 Technological environment
2. Globalization and international competitiveness
  - 2.1 Definition and development of globalization
  - 2.2 Opportunities and threats of globalization

2.3	International competitiveness
3.	International Trade
3.1	Theories and models of international trade
3.2	Importance of international trade for an economy
3.3	Protectionism as a threat to international business
4.	International financial and capital markets
4.1	Importance of international financial and capital markets for globally active companies
4.2	International exchange rate regimes
4.3	Hedging of exchange rate risks
5.	International organizations and economic integration
5.1	International organizations as the basis of the world economy (WTO, World Bank, IMF)
5.2	Regional economic integration as driver for international business (EU, USMCA)
6.	Current hot spots in the international economic and business environment
6.1	USA-China: Struggle for political and economic supremacy
6.2	Emerging Markets: new players in the global economy
6.3	Agenda 2030: Sustainable Development Goals (SDG)

<b>Literature</b>
<b>Compulsory Reading</b>
<b>Further Reading</b>
<ul style="list-style-type: none"><li>▪ Cavusgil, S. T., Knight, G. A., &amp; Riesenberger, J. R. (2020). International business: The new realities (5th ed.). Pearson.</li><li>▪ Daniels, J. D., Radebaugh, L. H., &amp; Sullivan, D. P. (2018). International business: Environments and operations (16th ed.). Pearson.</li></ul>

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

# Intercultural Management

Course Code: DLMINTIM01\_E

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

With the ever growing globalization of the economy, the demands on managers and employees to operate successfully in an international environment have increased. An important core competence of internationally active companies is the skill to competently deal with the idiosyncrasies of other cultures. In business administration, an independent discipline of intercultural management has therefore been developed to examine the behavior and cooperation of people from countries and organizations around the world and to derive recommendations for successful interactions on a corporate and personal level. This course provides students with a conceptual framework for a systematic understanding of the concept of culture, cultural synergies and differences, and the convergence and divergence of cultural norms and values. Students acquire the knowledge and intercultural skills necessary to manage and work across borders and cultures in a changing global business environment.

## Course Outcomes

On successful completion, students will be able to

- recognize and classify intercultural management as an independent discipline in business administration.
- use important cultural theories and cultural dimensions as a basis for business decisions in an international context.
- analyze relevant core competencies of a company for successful intercultural management and apply them in concrete situations.
- identify and manage culture-specific influences on the strategy, marketing and human resources of internationally active companies.
- apply important aspects of intercultural management in leadership, communication and cooperation in international teams.
- demonstrate cultural sensitivity and deeper understanding of international cooperation with selected cultural regions (Germany, USA, China).

## Contents

1. Fundamentals and Classification of Intercultural Management
  - 1.1 Intercultural Management as an Independent Discipline in Business Administration
  - 1.2 Important Cultural Concepts as Basis for Intercultural Management
  - 1.3 Important Cultural Dimensions as Basis for Intercultural Understanding

2. Role and Importance of Intercultural Management for Companies
  - 2.1 International Developments and Contexts for Enterprises
  - 2.2 Connection Between National Culture and Corporate Culture
  - 2.3 Entrepreneurial Core Competencies for Successful Intercultural Management
3. Diversity Management in Intercultural Management
  - 3.1 Working with Diversity in Companies
  - 3.2 Management Styles in Individualistic and Collectivist Cultures
  - 3.3 Reconciliation of Cultural Dilemmas
4. Entrepreneurial Decision-making Dimensions of Intercultural Management
  - 4.1 Strategy
  - 4.2 Marketing
  - 4.3 Human Resources Management (HRM)
5. Focal Points of Intercultural Management
  - 5.1 Intercultural Management and Corporate Governance
  - 5.2 Intercultural Communication
  - 5.3 Intercultural Zeamwork
6. Intercultural Management in Selected Countries
  - 6.1 Germany
  - 6.2 USA
  - 6.3 China

## Literature

### Compulsory Reading

### Further Reading

- Browaays, M-J. / Price, R. (2015): Understanding Cross-Cultural Management. 3rd Edition, Pearson, Upper Saddle River.
- Deresky, H. (2017): International Management: Managing Across Borders and Cultures. 9th Edition, Pearson Education Limited, Harlow.
- Steers, R. M. / Nardon, L. / Sanchez-Runde, C. J. (2016): Management across Cultures. Developing Global Competencies. Cambridge University Press, Cambridge.
- Thomas, D.C. / Inkson, K. (2017): Cultural Intelligence: Surviving and Thriving in the Global Village. 3rd Edition, Berrett-Koehler Publishers, Oakland.
- Trompenaars, F. (2012): Riding the Waves of Culture. Understanding Cultural Diversity in Global Business. 3rd Edition, N. Brealey Publishing, London/Boston.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## Process Management with Scrum

Module Code: DLMPREEPMS

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> <ul style="list-style-type: none"> <li>▪ none</li> <li>▪ DLMPREEPMS01</li> </ul>	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Nebojsa Radojevic (Process Management with Scrum) / Prof. Dr. Nebojsa Radojevic (Project: Corporate Project with Scrum)

### Contributing Courses to Module

- Process Management with Scrum (DLMPREEPMS01)
- Project: Corporate Project with Scrum (DLMPREEPMS02)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Process Management with Scrum

- Study Format "Distance Learning": Written Assessment: Case Study

##### Project: Corporate Project with Scrum

- Study Format "Distance Learning": Written Assessment: Project Report

### Weight of Module

see curriculum

### Module Contents

#### Process Management with Scrum

- Scrum Origin, Basic Idea and Fields of Application
- Scrum Roles
- Product Backlog and Sprint Planning
- Executing the Scrum Process
- Helpful Tools
- Implementation and Scaling of Scrum

#### Project: Corporate Project with Scrum

After studying the methods of Scrum and learning about the systematic development approach, this course offers the opportunity to transfer the learned contents to practice. Choosing a real project or task within an organization, the method can be experienced and compared to the theoretical concept.

### Learning Outcomes

#### Process Management with Scrum

On successful completion, students will be able to

- understand and explain the contents of the agile manifest.
- understand Scrum as a framework for developing, delivering, and sustaining products in a complex environment.
- describe each of the roles within a Scrum team and explain each item and each step within the Scrum process.
- handle the refinement process of the product backlog and discuss the interaction within the team and to the outside world during and after a sprint.
- understand the concept of user stories and apply the method to simple cases.
- understand and describe possibilities for the scaling of Scrum.

#### Project: Corporate Project with Scrum

On successful completion, students will be able to

- understand Scrum and its roles within the context of a corporate organization.
- explain the elements and processes of Scrum in detail and out of practical experience.
- create user stories, refine the product backlog and select items for a sprint.
- collaborate in the daily scrum and apply the little tools within the development team.
- discuss critically the benefits and limitations of the Scrum framework.

#### Links to other Modules within the Study Program

This module is similar to other moduls in the field of Project Management

#### Links to other Study Programs of the University

All Master Programs in the Business & Management field

## Process Management with Scrum

Course Code: DLMPREEPMS01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Within the broad field of project management, Scrum falls into the category of agile methods. As such, Scrum is more of a process management framework than a project management method. In this course the Scrum framework will be described and discussed in detail. The Agile Manifesto will be introduced, and the basic idea of iterative and incremental development will be discussed, leading up to the methodology of Scrum. A thorough review will be done on the different roles within the Scrum team. The terms product backlog, refinement and increment are defined and explained. As core feature of Scrum, the execution of sprints and daily scrums will be detailed. For the practical application of Scrum, the handling of requirements and creation of user stories will be introduced. The student also gets to know the little tools for communication and task-tracking used within development teams. Furthermore, the student will learn when and how a Scrum process should be implemented and what kind of benefits and risks can be expected from it.

### Course Outcomes

On successful completion, students will be able to

- understand and explain the contents of the agile manifest.
- understand Scrum as a framework for developing, delivering, and sustaining products in a complex environment.
- describe each of the roles within a Scrum team and explain each item and each step within the Scrum process.
- handle the refinement process of the product backlog and discuss the interaction within the team and to the outside world during and after a sprint.
- understand the concept of user stories and apply the method to simple cases.
- understand and describe possibilities for the scaling of Scrum.

### Contents

1. Scrum Origin, Basic Idea and Fields of Application
  - 1.1 The Birth of Scrum – How and Why it All Began
  - 1.2 The Agile Manifesto and a Change in Perspective
  - 1.3 The Approach of Iterative and Incremental Development
  - 1.4 Defining Fields for Scrum and Fields for Not Scrum
2. Scrum Roles



- 2.1 The Development Team
- 2.2 The Product Owner
- 2.3 The Scrum Master
- 2.4 The Customer Involvement
- 2.5 The Organization
3. Product Backlog and Sprint Planning
  - 3.1 Principles of a Product Backlog
  - 3.2 Refinement Process
  - 3.3 Definition of Ready
  - 3.4 Determining Capacity
  - 3.5 Selecting Items and Defining the Sprint Goal
4. Executing the Scrum Process
  - 4.1 The Scrum Process
  - 4.2 Sprint Cycle
  - 4.3 Daily Scrum
  - 4.4 Sprint Review
  - 4.5 Sprint Retrospective
5. Helpful Tools
  - 5.1 Requirements and User Stories
  - 5.2 Planning Poker
  - 5.3 Communication Tools (e. g. Task Board)
  - 5.4 Tracking Tools (e. g. Burn-down Chart)
  - 5.5 Available Software Tools
6. Implementation and Scaling of Scrum
  - 6.1 Implementation of Scrum in a Company
  - 6.2 Chances, Risks, and Limitations of Scrum
  - 6.3 Scrum of Scrums
  - 6.4 The Nexus Framework for Scaling Scrum
  - 6.5 Other Approaches

**Literature**

**Compulsory Reading**

**Further Reading**

- Highsmith, J. (2002). Agile software development ecosystems. Addison-Wesley Professional.
- Schwaber, K. (2004). Agile project management with Scrum. Microsoft Press.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Case Study

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

## Project: Corporate Project with Scrum

Course Code: DLMPREEPMS02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	DLMPREEPMS01

### Course Description

The course „Project: Corporate Project with Scrum” is building on the basic knowledge of the Scrum Framework acquired in the previous course. The theoretical foundations of Scrum can be applied within a real company environment. The student experiences the advantages of agile work and can reflect on the Scrum roles in practice. The student is also confronted with the hurdles that arise in applying the methodology in a real situation and can experiment with own approaches to solutions.

### Course Outcomes

On successful completion, students will be able to

- understand Scrum and its roles within the context of a corporate organization.
- explain the elements and processes of Scrum in detail and out of practical experience.
- create user stories, refine the product backlog and select items for a sprint.
- collaborate in the daily scrum and apply the little tools within the development team.
- discuss critically the benefits and limitations of the Scrum framework.

### Contents

- The course „Project: Corporate Project with Scrum” is building on the basic knowledge of the Scrum Framework acquired in the previous course and on the general knowledge of management know-how and classical project management acquired during the previous semesters. Based on a real task to be resolved within an organization (commercial enterprise, public administration, or the like), the students can gain practical experience working with agile methods utilizing the Scrum Framework.
- The students will reflect critically on the similarities and differences they observed and, if applicable, also compare the experienced agile methods with classical methods of project management. To meet scientific criteria, a literature search and a thorough comparison of the scientific and methodological foundation to the practical aspects experienced in the project is strongly encouraged and supported. The business aspect (costs, gain, time, quality, strategic relevance, etc.) of the project should be recognized and analyzed based on scientific methods. The students will demonstrate their ability to combine specialist knowledge and transfer of this knowledge to a specific project in a professional environment. They will also critically reflect on the experienced own work with Scrum, as well as on the theoretical concept of the Scrum Framework itself.

**Literature****Compulsory Reading****Further Reading**

- Anon. (2001): Manifesto for Agile Software Development. (URL: <https://agilemanifesto.org> [Retrieved: 20.03.2021]).
- Ockerman, S./ Reindl, S. (2019): Mastering Professional Scrum: Coaches' Notes for Busting Myths, Solving Challenges, and Growing Agility. Addison Wesley Longman, Boston.
- Rubin, K. S. (2013): Essential Scrum: A Practical Guide to the Most Popular Agile Process. Addison-Wesley Professional, Boston.
- Schwaber, K. / Sutherland, J. V. (2012): Software in 30 days: How Agile Managers Beat the Odds, Delight their Customers and Leave Competitors in the Dust. Wiley, New Jersey.
- Sutherland, J. (2015): Scrum: The art of Doing Twice the Work in Half the Time. Random House UK, London.
- Verheyen, G. (2019): Scrum: A Pocket Guide: a Smart Travel Companion. 2nd edition, Van Haren Publishing, VW 's-Hertogenbosch.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Project Management with PRINCE2®

Module Code: DLMPREEMPR

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> <ul style="list-style-type: none"> <li>▪ DLMPREEMPR01</li> <li>▪ none</li> </ul>	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Nebojsa Radojevic (Project Management with PRINCE2®) / Prof. Dr. Nebojsa Radojevic (Project: Corporate Project with PRINCE2®)

### Contributing Courses to Module

- Project Management with PRINCE2® (DLMPREEMPR01)
- Project: Corporate Project with PRINCE2® (DLMPREEMPR02)

### Module Exam Type

#### Module Exam

#### Split Exam

Project Management with PRINCE2®

- Study Format "Distance Learning": Written Assessment: Case Study

Project: Corporate Project with PRINCE2®

- Study Format "Distance Learning": Written Assessment: Project Report

### Weight of Module

see curriculum

<p><b>Module Contents</b></p> <p><b>Project Management with PRINCE2®</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to the PRINCE2® Method</li> <li>▪ The Seven Themes</li> <li>▪ The Seven Processes</li> <li>▪ Creation of Results</li> <li>▪ Tailoring</li> <li>▪ PRINCE2® Agile</li> </ul> <p><b>Project: Corporate Project with PRINCE2®</b></p> <p>After studying the methods of the structured project management approach of PRINCE2®, this course offers the opportunity to transfer the learned contents to practice. Choosing a real project or task within an organization, the method can be experienced and compared to the theoretical concept.</p>	
<p><b>Learning Outcomes</b></p> <p><b>Project Management with PRINCE2®</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ understand and explain the contents of the PRINCE2® framework.</li> <li>▪ explain the seven Principles, seven Themes, seven Processes and Tailoring of the project environment.</li> <li>▪ describe each of the roles within a PRINCE2® management team.</li> <li>▪ explain, how the stages are connected by the defined processes.</li> <li>▪ define reporting cycles according to the PRINCE2® guidelines.</li> <li>▪ understand and describe how PRINCE2® can be combined with other project management methods and what additional options PRINCE2® Agile is offering.</li> </ul> <p><b>Project: Corporate Project with PRINCE2®</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ understand PRINCE2® and its principles within the context of a corporate organization.</li> <li>▪ explain the PRINCE2® Project Management structure as well as the themes and processes of PRINCE2® in detail and out of practical experience.</li> <li>▪ set up a Project Management Team with its associated roles.</li> <li>▪ start and initiate a project and plan a project stage.</li> <li>▪ work with and create management products and specialized products.</li> <li>▪ discuss critically the benefits and limitations of the PRINCE2® framework.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the field of Project Management</p>	<p><b>Links to other Study Programs of the University</b></p> <p>All Master Programs in the Business &amp; Management field</p>



## Project Management with PRINCE2®

Course Code: DLMPREEMPR01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Within the broad field of project management methods, the original PRINCE2® method falls into the category of classical (non-agile) methods. It is one of the leading classical project management methods. PRINCE2® is process-oriented and primarily concerned with the actions of the project management team, putting emphasis on the management aspect of a project rather than the execution side. In this course the PRINCE2® framework will be systematically described and discussed in detail. A thorough review will be done on the seven Principles, the seven Themes, the seven Processes, and on Tailoring of the project to the environment. This will be put in relation to the defined roles within the PRINCE2® project management team structure. In this course, in addition to the actions and processes handled by the project management team, the work of the task managers will be reviewed, some of the most important tools for execution of tasks will be introduced and a possible combination with the PMBOK from the PMI will be discussed. The student will learn about the well-structured interaction between project management level and project execution level including the reporting cycles. At the end of the course an outlook on the features of PRINCE2® Agile will be given. The student will gain a thorough understanding of the advantages and disadvantages of the PRINCE2® method and its derivatives.

### Course Outcomes

On successful completion, students will be able to

- understand and explain the contents of the PRINCE2® framework.
- explain the seven Principles, seven Themes, seven Processes and Tailoring of the project environment.
- describe each of the roles within a PRINCE2® management team.
- explain, how the stages are connected by the defined processes.
- define reporting cycles according to the PRINCE2® guidelines.
- understand and describe how PRINCE2® can be combined with other project management methods and what additional options PRINCE2® Agile is offering.

### Contents

1. Introduction to the PRINCE2® Method
  - 1.1 History of PRINCE2®
  - 1.2 Project Definition
  - 1.3 The Seven Principles

- 1.4 The Project Management Team – Structure and Roles
- 1.5 Management Products and Specialist Products
2. The Seven Themes
  - 2.1 Introduction to Themes
  - 2.2 Business Case
  - 2.3 Organization
  - 2.4 Quality
  - 2.5 Plans
  - 2.6 Risk
  - 2.7 Change
  - 2.8 Progress
3. The Seven Processes
  - 3.1 Overview and Interaction of the Processes
  - 3.2 Starting up a Project
  - 3.3 Initiating a Project
  - 3.4 Directing a Project
  - 3.5 Controlling a Stage
  - 3.6 Managing Product Delivery
  - 3.7 Managing Stage Boundaries
  - 3.8 Closing a Project
4. Creation of Results
  - 4.1 Creation of Management Products
  - 4.2 Creation of Specialist Products
5. Tailoring
  - 5.1 Tailoring of PRINCE2® to the Organization
  - 5.2 Scaling of PRINCE2® by Combining Roles
  - 5.3 Combining PRINCE2® with other Project Management Methods
6. PRINCE2® Agile
  - 6.1 Goal of PRINCE2® Agile
  - 6.2 Overview of PRINCE2® Agile
  - 6.3 Similarities and Differences to the Original PRINCE2®

**Literature****Compulsory Reading****Further Reading**

- AXELOS Limited. (2017). Managing successful projects with PRINCE2® (6th ed.). The Stationery Office.
- Cooke, J. L. (2016). PRINCE2 Agile. An implementation pocket guide: Step-by-step advice for every project type. IT Governance Publishing.
- International Conference on Electronics, Computers, and Artificial Intelligence, Universitatea din Pitești, Institute of Electrical and Electronics Engineers, IEEE Industry Applications Society, & ECAI. (2017, June 29–July 1). Proceedings of the 9th International Conference on Electronics, Computers and Artificial Intelligence, New Jersey.
- Mathis, B. (2014). Prince2 for beginners: Prince2 study guide for certification and project management. CreateSpace Independent Publishing Platform.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Written Assessment: Case Study

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 20 h	<b>Self Test</b> 20 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Online Tests <input checked="" type="checkbox"/> Guideline

## Project: Corporate Project with PRINCE2®

Course Code: DLMPREEMPR02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	DLMPREEMPR01

### Course Description

The course „Project: Corporate Project with PRINCE2®“ is building on the basic knowledge of the PRINCE2® framework acquired in the previous course. The studied theoretical concept can be applied within a real company environment. The student experiences the advantages of project management in stages and can reflect on the relation between project management and task execution. The student is also confronted with the hurdles that arise in applying the methodology in a real situation and can experiment with own approaches to solutions.

### Course Outcomes

On successful completion, students will be able to

- understand PRINCE2® and its principles within the context of a corporate organization.
- explain the PRINCE2® Project Management structure as well as the themes and processes of PRINCE2® in detail and out of practical experience.
- set up a Project Management Team with its associated roles.
- start and initiate a project and plan a project stage.
- work with and create management products and specialized products.
- discuss critically the benefits and limitations of the PRINCE2® framework.

### Contents

- The course „Project: Corporate Project with PRINCE2®“ is building on the basic knowledge of the PRINCE2® framework acquired in the previous course and on the general knowledge of management know-how and classical project management acquired during the previous semesters. Based on a real task to be resolved within an organization (commercial enterprise, public administration, or the like), the students can gain practical experience in setting up a project management team according to PRINCE2®.
- The students will reflect critically on the similarities and differences they observed, and, if applicable, also compare the experienced classical methods with agile methods of project management. To meet scientific criteria, a literature search and a thorough comparison of the scientific and methodological foundation to the practical aspects experienced in the project is strongly encouraged and supported. The business aspect (costs, gain, time, quality, strategic relevance, etc.) of the project should be recognized and analyzed based on scientific methods. The students will demonstrate their ability to combine specialist

knowledge and transfer of this knowledge to a specific project in a professional environment. They will also critically reflect on the experienced own work with PRINCE2®, as well as on the theoretical concept of the PRINCE2® framework itself.

### Literature

#### Compulsory Reading

#### Further Reading

- AXELOS Limited (2017): Managing Successful Projects with Prince2. TSO, London.
- Bentley, C. (2019): The Concise PRINCE2®: Principles and Essential Themes. 3rd ed., IT Governance Publishing, Cambridgeshire.
- Cooke, J. L. (2016): PRINCE2 Agile An Implementation Pocket Guide: Step-by-Step Advice for Every Project Type. IT GOVERNANCE PUBLISHING, New York.
- International Conference on Electronics, Computers and Artificial Intelligence; Universitatea din Pitești; Institute of Electrical and Electronics Engineers; IEEE Industry Applications Society; ECAI (2017). Proceedings of the 9th International Conference on Electronics, Computers and Artificial Intelligence - ECAI-2017: 29 June - 01 July 2017, IEEE: New Jersey.
- Mathis, B. (2014): Prince2 for Beginners: Prince2 Study Guide for certification & project management. N.p.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Salesforce Consultant Specialization

Module Code: DLMSFCS

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	MA	10	300 h

Semester / Term	Duration	Regularly offered in	Language of Instruction and Examination
see curriculum	Minimum 1 semester	WiSe/SoSe	English

<p><b>Module Coordinator</b></p> <p>Prof. Dr. Sebastian Werning (Salesforce Administrator and Service Cloud Consultant) / Prof. Dr. Sebastian Werning (Salesforce Sales Cloud Consultant )</p>
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<p><b>Contributing Courses to Module</b></p> <ul style="list-style-type: none"> <li>▪ Salesforce Administrator and Service Cloud Consultant (DLMSFCS01)</li> <li>▪ Salesforce Sales Cloud Consultant (DLMSFCS02)</li> </ul>
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<b>Module Exam Type</b>	
<p><b>Module Exam</b></p>	<p><b>Split Exam</b></p> <p><u>Salesforce Administrator and Service Cloud Consultant</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Written Assessment: Project Report</li> <li>• Study Format "myStudies": Written Assessment: Project Report</li> </ul> <p><u>Salesforce Sales Cloud Consultant</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Oral Project Report</li> <li>• Study Format "myStudies": Oral Project Report</li> </ul>
<p><b>Weight of Module</b></p> <p>see curriculum</p>	



### Module Contents

#### Salesforce Administrator and Service Cloud Consultant

Using the learning platform Trailhead students will learn to administer the Salesforce platform. At the end of the course the students will be able to manage the Salesforce service cloud. This course is the preparation for the Salesforce Administrator Certification and Salesforce Service Cloud Certification.

#### Salesforce Sales Cloud Consultant

Using the learning platform Trailhead students will learn how to manage sales processes with Salesforce platform. At the end of the course the students will be able to manage the Salesforce sales cloud. This course prepares for the Salesforce Sales Cloud Consultant Certification.

### Learning Outcomes

#### Salesforce Administrator and Service Cloud Consultant

On successful completion, students will be able to

- define what Salesforce and customer relationship management is.
- describe and compare the different options for importing and exporting data in Salesforce.
- create reports and visualize key business metrics in real-time in Salesforce.
- setup customer service with Salesforce service cloud.
- lead a customer service team in the digital era.
- define service cloud goals and metrics.

#### Salesforce Sales Cloud Consultant

On successful completion, students will be able to

- setup sales management with Salesforce sales cloud.
- lead a sales team in the digital era.
- create digital engagement on multiple channels.
- define sales cloud goals and metrics.
- deploy sales processes for gathering competitive insights.

#### Links to other Modules within the Study Program

This module is similar to other modules in the field of Marketing & Sales

#### Links to other Study Programs of the University

All Master Programs in the Marketing & Communication field

## Salesforce Administrator and Service Cloud Consultant

Course Code: DLMSFCS01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Salesforce is the most used software solution for customer relationship management worldwide. Using the learning platform Trailhead students will learn independently the fundamentals of Salesforce. The course explains how to administrate Salesforce and how to create processes to help supporting teams become more efficient and manage large data volumes within Salesforce. This course prepares students for the Salesforce Administrator Certification and Salesforce Service Cloud Certification.

### Course Outcomes

On successful completion, students will be able to

- define what Salesforce and customer relationship management is.
- describe and compare the different options for importing and exporting data in Salesforce.
- create reports and visualize key business metrics in real-time in Salesforce.
- setup customer service with Salesforce service cloud.
- lead a customer service team in the digital era.
- define service cloud goals and metrics.

### Contents

- The content on the learning platform focuses on the features and functionality used to maintain a Salesforce implementation. The content provides general knowledge of the features available to end users and the configuration options available to a Salesforce Administrator. Furthermore, the content enables to perform administrative functions using current Salesforce features design solutions using the Service Cloud functionality and to lead the implementation of these solutions within a customer organization.

### Literature

#### Compulsory Reading

#### Further Reading

- According to the Information given on the learning platform

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>

# Salesforce Sales Cloud Consultant

Course Code: DLMSFCS02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

This course facilitates key aspects of setting up sales management with Salesforce sales cloud on the learning platform Trailhead. The course describes how to implement Salesforce sales cloud and manage it. It enables to make better business decisions based on customer data and to create a sales metrics strategy. The course shows how to create processes to help sales teams become more efficient and manage large data volumes within Salesforce. This course prepares students for the Salesforce Sales Cloud Consultant Certification.

## Course Outcomes

On successful completion, students will be able to

- setup sales management with Salesforce sales cloud.
- lead a sales team in the digital era.
- create digital engagement on multiple channels.
- define sales cloud goals and metrics.
- deploy sales processes for gathering competitive insights.

## Contents

- The content on the learning platform focuses on designing and deploying solutions that support sales teams and sales processes using Salesforce applications. The content enables to design solutions using the Salesforce sales cloud functionality and to lead the implementation of these solutions within an organization.

## Literature

### Compulsory Reading

### Further Reading

- According to the Information given on the learning platform

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Oral Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Oral Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>

## Salesforce Developer Specialization

Module Code: DLMSFDS

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Thomas Bolz (Salesforce Platform App Builder ) / Prof. Dr. Thomas Bolz (Salesforce Platform Developer )

### Contributing Courses to Module

- Salesforce Platform App Builder (DLMSFDS01)
- Salesforce Platform Developer (DLMSFDS02)

### Module Exam Type

<b>Module Exam</b>	<b>Split Exam</b>
	<p><u>Salesforce Platform App Builder</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Written Assessment: Project Report</li> </ul> <p><u>Salesforce Platform Developer</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Oral Project Report</li> </ul>

### Weight of Module

see curriculum



**Module Contents****Salesforce Platform App Builder**

Using the learning platform Trailhead students will learn the fundamentals of Salesforce. At the end of the course, the students will be able to design, build and deploy custom applications. This course prepares for the Salesforce Platform App Builder Certification.

**Salesforce Platform Developer**

Using the learning platform Trailhead students will learn how to develop own applications, built from various parts of the Salesforce platform. At the end of the course the students will be able to use Apex, JavaScript, Visualforce and basic Lightning components. This course prepares for the Salesforce Platform Developer I and JavaScript Developer I Certification.

**Learning Outcomes****Salesforce Platform App Builder**

On successful completion, students will be able to

- define what Salesforce and customer relationship management is.
- design the data model, user interface and business logic for custom applications.
- customize applications for mobile use.
- design reports and dashboards.
- manage application security and deploy custom applications.

**Salesforce Platform Developer**

On successful completion, students will be able to

- develop own applications using Apex and basic Lightning components.
- write SOSL, SOQL and DML statements.
- use Visualforce to build custom user interfaces for mobile and web apps.
- build reusable, performant components that follow modern web standards.
- use JavaScript to handle user interactions.
- use the built-in testing framework to test Apex and Visualforce.

**Links to other Modules within the Study Program**

This module is similar to other modules in the field of Marketing & Sales

**Links to other Study Programs of the University**

All Master Programs in the Marketing & Communication field

## Salesforce Platform App Builder

Course Code: DLMSFDS01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

Salesforce is the most used software solution for customer relationship management worldwide. This solution can be customized and personalized for the needs of customers, partners and employees. Using the learning platform Trailhead, students will learn independently the fundamentals of Salesforce and the development of customized application. This course prepares students for the Salesforce Platform App Builder Certification.

### Course Outcomes

On successful completion, students will be able to

- define what Salesforce and customer relationship management is.
- design the data model, user interface and business logic for custom applications.
- customize applications for mobile use.
- design reports and dashboards.
- manage application security and deploy custom applications.

### Contents

- The content on the learning platform focuses on the features and functionality to design, build and deploy custom applications. The content also provides knowledge to define business logic and process automation declaratively. Furthermore, the design and management of the correct data models and the customization of applications for individual needs is included in this course. Thus, the content of this course enables to automate repetitive tasks and to optimize processes in customer organizations.

### Literature

#### Compulsory Reading

#### Further Reading

- Benioff, M./Langley, M. (2019): Trailblazer. The Power of Business as the Greatest Platform for Change. 1st ed.
- Shaalan, S. (2020): Salesforce for Beginners. A step-by-step guide to creating, managing, and automating sales and marketing processes. Packt Publishing, Birmingham.
- Weinmeister, P. (2019): Practical Salesforce Development Without Code. Building Declarative Solutions on the Salesforce Platform. 2nd ed., Apress, Berkeley.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

# Salesforce Platform Developer

Course Code: DLMSFDS02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

The Salesforce platform not only forms the foundation of core Salesforce products like Sales Cloud and Service Cloud, but it is also possible to build own functionality and own applications. Using the learning platform Trailhead, students will learn how to use the programmatic pillars of the Salesforce platform: Lightning components, Apex and Visualforce. This course prepares students for the Salesforce Platform Developer I and JavaScript Developer I Certification.

## Course Outcomes

On successful completion, students will be able to

- develop own applications using Apex and basic Lightning components.
- write SOSL, SOQL and DML statements.
- use Visualforce to build custom user interfaces for mobile and web apps.
- build reusable, performant components that follow modern web standards.
- use JavaScript to handle user interactions.
- use the built-in testing framework to test Apex and Visualforce.

## Contents

- The content on the learning platform focuses on the development of own functionality and own applications, built from various parts of the Salesforce platform. The content enables to use the programmatic elements Lightning components, Apex and Visualforce. Furthermore, knowledge is provided for data modeling, process automation, user interface design, testing and deployment. Thus, the content of this course enables to extend Salesforce by individual applications to cover the needs in customer organizations.

## Literature

### Compulsory Reading

### Further Reading

- Gupta, R. (2019): Salesforce Platform App Builder Certification. A Practical Study Guide. 1st ed., Apress.
- Salesforce (2020): Developer Documentation. (URL: <https://developer.salesforce.com/docs/> [accessed: 12.12.2020]).

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Oral Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## AI and Mastering AI Prompting

Module Code: DLMEAIMAIP

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> MA	<b>CP</b> 10	<b>Student Workload</b> 300 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Claudia Heß (Artificial Intelligence) / N.N. (Project: AI Excellence with Creative Prompting Techniques)

### Contributing Courses to Module

- Artificial Intelligence (DLMAIAI01)
- Project: AI Excellence with Creative Prompting Techniques (DLMPAIECPT01)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Artificial Intelligence

- Study Format "Distance Learning": Exam, 90 Minutes
- Study Format "myStudies": Exam, 90 Minutes

##### Project: AI Excellence with Creative Prompting Techniques

- Study Format "Distance Learning": Written Assessment: Project Report

### Weight of Module

see curriculum

### Module Contents

#### Artificial Intelligence

- History of AI
- Expert Systems
- Neuroscience
- Modern AI Systems
- AI Application Areas

#### Project: AI Excellence with Creative Prompting Techniques

In this module, students delve into the world of generative AI applications, creating AI-generated content such as text, images, and videos. They learn to design, analyze, and evaluate different prompting techniques in these systems and apply them within their respective fields of study.

### Learning Outcomes

#### Artificial Intelligence

On successful completion, students will be able to

- remember the historical developments in the field of artificial intelligence.
- analyze the different application areas of artificial intelligence.
- comprehend expert systems.
- apply Prolog to simple expert systems.
- comprehend the brain and cognitive processes from a neuro-scientific point of view.
- understand modern developments in artificial intelligence.

#### Project: AI Excellence with Creative Prompting Techniques

On successful completion, students will be able to

- comprehend and implement various prompting techniques in generative AI applications.
- analyze, assess, and combine different prompt techniques for various expected AI outputs.
- implement ethical considerations into the design and execution of various generative AI applications.
- design, implement, and refine effective prompts and their combinations for real-world scenarios through various hands-on exercises.
- showcase creative and innovative thinking and reasoning in the application of advanced prompting techniques to solve multidimensional problems in their specialized area of study.

#### Links to other Modules within the Study Program

This module is similar to other modules in the field of Data Science & Artificial Intelligence

#### Links to other Study Programs of the University

All Master Programs in the IT & Technology field

# Artificial Intelligence

Course Code: DLMAIAI01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

## Course Description

The quest for artificial intelligence has captured humanity's interest for many decades and has been an active research area since the 1960s. This course will give a detailed overview of the historical developments, successes, and set-backs in AI, as well as the development and use of expert systems in early AI systems. In order to understand cognitive processes, the course will give a brief overview of the biological brain and (human) cognitive processes and then focus on the development of modern AI systems fueled by recent developments in hard- and software. Particular focus will be given to discussion of the development of "narrow AI" systems for specific use cases vs. the creation of general artificial intelligence. The course will give an overview of a wide range of potential application areas in artificial intelligence, including industry sectors such as autonomous driving and mobility, medicine, finance, retail, and manufacturing.

## Course Outcomes

On successful completion, students will be able to

- remember the historical developments in the field of artificial intelligence.
- analyze the different application areas of artificial intelligence.
- comprehend expert systems.
- apply Prolog to simple expert systems.
- comprehend the brain and cognitive processes from a neuro-scientific point of view.
- understand modern developments in artificial intelligence.

## Contents

1. History of AI
  - 1.1 Historical Developments
  - 1.2 AI Winter
  - 1.3 Notable Advances in AI
2. Expert Systems
  - 2.1 Overview Over Expert Systems
  - 2.2 Introduction to Prolog
3. Neuroscience
  - 3.1 The (Human) Brain



### 3.2 Cognitive Processes

## 4. Modern AI Systems

### 4.1 Recent Developments in Hard- and Software

### 4.2 Narrow vs General AI

### 4.3 NLP and Computer Vision

## 5. AI Application Areas

### 5.1 Autonomous Vehicles & Mobility

### 5.2 Personalized Medicine

### 5.3 FinTech

### 5.4 Retail & Industry

## Literature

### Compulsory Reading

### Further Reading

- Chowdhary, K. R. (2020). Fundamentals of Artificial Intelligence. Springer India.
- Russell, S. & Norvig, P. (2022). Artificial intelligence. A modern approach (4th ed.). Pearson Education.
- Ward, J. (2020). The student's guide to cognitive neuroscience. (4th ed.). Taylor & Francis Group.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Lecture
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 30 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>		
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed	<b>Learning Material</b> <input checked="" type="checkbox"/> Course Book <input checked="" type="checkbox"/> Video <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Practice Exam <input checked="" type="checkbox"/> Online Tests

## Project: AI Excellence with Creative Prompting Techniques

Course Code: DLMPAIECPT01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		5	none

### Course Description

In this course, students explore the exciting world of prompting in various generative AI applications. They involve themselves in hands-on exercises that combine various prompting techniques to create new AI-generated content, including text, images, and videos. Through these exercises, students learn how to effectively use, analyze, combine, and assess these systems within their specialized fields of study.

### Course Outcomes

On successful completion, students will be able to

- comprehend and implement various prompting techniques in generative AI applications.
- analyze, assess, and combine different prompt techniques for various expected AI outputs.
- implement ethical considerations into the design and execution of various generative AI applications.
- design, implement, and refine effective prompts and their combinations for real-world scenarios through various hands-on exercises.
- showcase creative and innovative thinking and reasoning in the application of advanced prompting techniques to solve multidimensional problems in their specialized area of study.

### Contents

- In this course, students engage in a practical application of a generative AI use case by choosing from the options provided in the extensive supplementary guide. The course presents practical examples as study materials and exercises with both individual and combined prompting techniques for open-source text, image, and video generation use cases. The exercises are crafted to inspire and lead students in executing their distinct generative AI use case work and provide guidance on describing the use case and selecting a mixture of prompting techniques. Additionally, students are led to critically evaluate the design, implementation, and the outcomes from both technical and ethical perspectives.

**Literature****Compulsory Reading****Further Reading**

- Dang, H., Mecke, L., Lehmann, F., Goller, S., & Buschek, D. (2022). How to prompt? Opportunities and challenges of zero- and few-shot learning for human-AI interaction in creative applications of generative models. arXiv. <https://arxiv.org/pdf/2209.01390.pdf>
- Epstein, Z., Hertzmann, A., Herman, L., Mahari, R., Frank, M. R., Groh, M., Schroeder, H., Smith, A., Akten, M., Fjeld, J., Farid, H., Leach, N., Pentland, A. S., & Russakovsky, O. (2023). Art and the science of generative AI: A deeper dive. arXiv. <https://arxiv.org/pdf/2306.04141.pdf>
- Gozalo-Brizuela, R., & Garrido-Merchán, E. C. (2023). A survey of generative AI applications. arXiv. <https://arxiv.org/pdf/2306.02781.pdf>
- Wei, J., Wang, X., Schuurmans, D., Bosma, M., Ichter, B., Xia, F., Chi, E. H., Le, Q. V., & Zhou, D. (2023). Chain-of-thought prompting elicit reasoning in large language models. arXiv. <https://arxiv.org/pdf/2201.11903.pdf>

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 30 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<b>Tutorial Support</b> <input checked="" type="checkbox"/> Course Feed <input checked="" type="checkbox"/> Intensive Live Sessions/Learning Sprint	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Master Thesis

Module Code: DLMMTHES

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> See current study and exam regulations (SPO)	<b>Study Level</b> MA	<b>CP</b> 15	<b>Student Workload</b> 450 h
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<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction and Examination</b> English
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### Module Coordinator

Prof. Dr. Tianxiang Lu (Master Thesis) / Prof. Dr. Tianxiang Lu (Colloquium)

### Contributing Courses to Module

- Master Thesis (DLMMTHES01)
- Colloquium (DLMMTHES02)

### Module Exam Type

<b>Module Exam</b>	<p><b>Split Exam</b></p> <p><u>Master Thesis</u></p> <ul style="list-style-type: none"> <li>• Study Format "Distance Learning": Master Thesis (90)</li> <li>• Study Format "myStudies": Master Thesis (90)</li> </ul> <p><u>Colloquium</u></p> <ul style="list-style-type: none"> <li>• Study Format "myStudies": Colloquium (10)</li> <li>• Study Format "Distance Learning": Colloquium (10)</li> </ul>
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### Weight of Module

see curriculum

**Module Contents****Master Thesis**

- Written Master Thesis

**Colloquium**

- Thesis Defense

**Learning Outcomes****Master Thesis**

On successful completion, students will be able to

- work on a problem from their major field of study by applying the specialist and methodological skills they have acquired during their studies.
- analyse selected tasks with scientific methods, critically evaluate them and develop appropriate solutions under the guidance of an academic supervisor.
- record and analyse existing (research) literature appropriate to the topic of the Master's thesis.
- prepare a detailed written elaboration in compliance with scientific methods.

**Colloquium**

On successful completion, students will be able to

- present a problem from their field of study under consideration of academic presentation and communication techniques.
- reflect on the scientific and methodological approach chosen in the Master's thesis.
- actively answer subject-related questions from subject experts (experts of the Master's thesis).

**Links to other Modules within the Study Program**

All modules in the Master Program

**Links to other Study Programs of the University**

All Master Programs



## Master Thesis

Course Code: DLMMTHES01

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		13.5	See current study and exam regulations (SPO)

### Course Description

The aim and purpose of the Master's thesis is to successfully apply the subject-specific and methodological competencies acquired during the course of study in the form of an academic dissertation with a thematic reference to the major field of study. The content of the Master's thesis can be a practical-empirical or theoretical-scientific problem. Students should prove that they can independently analyse a selected problem with scientific methods, critically evaluate it and work out proposed solutions under the subject-methodological guidance of an academic supervisor. The topic to be chosen by the student from the respective field of study should not only prove the acquired scientific competences, but should also deepen and round off the academic knowledge of the student in order to optimally align his professional abilities and skills with the needs of the future field of activity.

### Course Outcomes

On successful completion, students will be able to

- work on a problem from their major field of study by applying the specialist and methodological skills they have acquired during their studies.
- analyse selected tasks with scientific methods, critically evaluate them and develop appropriate solutions under the guidance of an academic supervisor.
- record and analyse existing (research) literature appropriate to the topic of the Master's thesis.
- prepare a detailed written elaboration in compliance with scientific methods.

### Contents

- Within the framework of the Master's thesis, the problem as well as the scientific research goal must be clearly emphasized. The work must reflect the current state of knowledge of the topic to be examined by means of an appropriate literature analysis. The student must prove his ability to use the acquired knowledge theoretically and/or empirically in the form of an independent and problem-solution-oriented application.

**Literature**

**Compulsory Reading**

**Further Reading**

- Bui, Y. N. (2013). *How to Write a Master's Thesis* (2nd ed.). SAGE Publications, Incorporated.
- Turabian, K. L. (2013). *A Manual for Writers of Research Papers, theses, and dissertations* (8th ed.). University of Chicago Press.
- Further subject specific literature

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Thesis
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Master Thesis

<b>Student Workload</b>					
<b>Self Study</b> 405 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 0 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 405 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Thesis
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Master Thesis

<b>Student Workload</b>					
<b>Self Study</b> 405 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 0 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 405 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

## Colloquium

Course Code: DLMMTHES02

Study Level	Language of Instruction and Examination	Contact Hours	CP	Admission Requirements
MA	English		1.5	See current study and exam regulations (SPO)

### Course Description

The colloquium will take place after submission of the Master's thesis. This is done at the invitation of the experts. During the colloquium, the students must prove that they have fully independently produced the content and results of the written work. The content of the colloquium is a presentation of the most important work contents and research results by the student, and the answering of questions by the experts.

### Course Outcomes

On successful completion, students will be able to

- present a problem from their field of study under consideration of academic presentation and communication techniques.
- reflect on the scientific and methodological approach chosen in the Master's thesis.
- actively answer subject-related questions from subject experts (experts of the Master's thesis).

### Contents

- The colloquium includes a presentation of the most important results of the Master's thesis, followed by the student answering the reviewers' technical questions.

### Literature

#### Compulsory Reading

#### Further Reading

- Renz, K.-C. (2016): The 1 x 1 of the presentation. For school, study and work. 2nd edition, Springer Gabler, Wiesbaden.

**Study Format myStudies**

<b>Study Format</b> myStudies	<b>Course Type</b> Thesis Defense
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Colloquium

<b>Student Workload</b>					
<b>Self Study</b> 45 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 0 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 45 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Thesis Defense
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<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>Online Tests:</b> no
<b>Type of Exam</b>	Colloquium

<b>Student Workload</b>					
<b>Self Study</b> 45 h	<b>Contact Hours</b> 0 h	<b>Tutorial/Tutorial Support</b> 0 h	<b>Self Test</b> 0 h	<b>Independent Study</b> 0 h	<b>Hours Total</b> 45 h

<b>Instructional Methods</b>	
<b>Learning Material</b> <input checked="" type="checkbox"/> Slides	<b>Exam Preparation</b> <input checked="" type="checkbox"/> Guideline