MODULE HANDBOOK

Bachelor of Science
Software Development (FS-OI-BASD)

180 ECTS
Distance Learning
Contents

1. Semester

**Module IGIS_E: Software Engineering Principles**
Module Description .............................................................. 13
Course IGIS01_E: Software Engineering Principles ...................... 15

**Module DLBCSIAW: Introduction to Academic Work**
Module Description ..................................................................... 19
Course DLBCSIAW01: Introduction to Academic Work .................. 21

**Module DLBCSRE: Requirements Engineering**
Module Description ..................................................................... 27
Course DLBCSRE01: Requirements Engineering .......................... 29

**Module DLBCSS: Specification**
Module Description ..................................................................... 35
Course DLBCSS01: Specification .................................................. 37

**Module DLBCSOOPJ: Object-oriented Programming with Java**
Module Description ..................................................................... 43
Course DLBCSOOPJ01: Object-oriented Programming with Java .... 45

**Module DLBCSDMDS: Database Modeling and Database Systems**
Module Description ..................................................................... 51
Course DLBCSDMDS01: Database Modeling and Database Systems ... 53

2. Semester

**Module DLBCSDSJCL: Data structures and Java class library**
Module Description ..................................................................... 61
Course DLBCSDSJCL01: Data structures and Java class library ....... 63

**Module DLBCSW: Collaborative Work**
Module Description ..................................................................... 67
Course DLBCSW01: Collaborative Work ........................................ 69

**Module DLBCSWAD: Web Application Development**
Module Description ..................................................................... 75
Course DLBCSWAD01: Web Application Development .................... 77
Module DLBCSL: Algorithms, Data Structures, and Programming Languages
Module Description ................................................................. 81
Course DLBCSL01: Algorithms, Data Structures, and Programming Languages 83

Module DLBCSSQA: Software Quality Assurance
Module Description ................................................................. 89
Course DLBCSSQA01: Software Quality Assurance 91

Module IAMG_E: IT Architecture Management
Module Description ................................................................. 97
Course DLBCSEITPAM02: IT Architecture Management 99

3. Semester

Module IPWA2_E: Programming Information Systems with Java EE
Module Description ................................................................. 107
Course IPWA02_E: Programming Information Systems with Java EE 109

Module DLBSEPENIT_E: Ethics and Sustainability in IT
Module Description ................................................................. 113
Course DLBSEPENIT01_E: Ethics and Sustainability in IT 115

Module DLBCSEITPAM1: IT Project Management
Module Description ................................................................. 119
Course DLBCSEITPAM01: IT Project Management 121

Module IWNF1_E: Techniques and methods for agile software development
Module Description ................................................................. 125
Course IWNF01_E: Techniques and methods for agile software development 127

Module IWMB1_E: Introduction to Mobile Software Engineering
Module Description ................................................................. 131
Course IWMB01_E: Mobile Software Engineering 133

Module ISSE_E: Seminar: Software Engineering
Module Description ................................................................. 137
Course ISSE01_E: Seminar: Software Engineering 139

4. Semester

Module IWNF2_E: Project: Agile Software Engineering
Module Description ................................................................. 147
Course IWNF02_E: Project: Agile Software Engineering 149
Module DLBSEPITI_E: IT Infrastructure
Module Description .......................................................... 151
Course DLBSEPITI01_E: IT Infrastructure .......................... 153

Module DLBCSITSM-01: IT Service Management
Module Description .......................................................... 157
Course DLBCSITSM01-01: IT Service Management ............... 159

Module IWMB2-01_E: Project: Mobile Software Engineering
Module Description ......................................................... 163
Course IWMB02-01_E: Project: Mobile Software Engineering .... 165

Module DLBSEPCP_E: Cloud Programming
Module Description .......................................................... 169
Course DLBSEPCP01_E: Cloud Programming ....................... 171

Module DLBCSIDPITS: Introduction to Data Protection and Cyber Security
Module Description ........................................................ 175
Course DLBCSIDPITS01: Introduction to Data Protection and Cyber Security .......................... 177

5. Semester

Module DLBSEPDOCD_E: DevOps and Continuous Delivery
Module Description .......................................................... 185
Course DLBSEPDOCD01_E: DevOps and Continuous Delivery .... 187

Module DLBMIUID1_E: User Interface Design and Ergonomics
Module Description ......................................................... 191
Course DLBMIUID01_E: User Interface Design and Ergonomics .......... 193

Module DLBDSIPWP: Introduction to Programming with Python
Module Description ........................................................ 197
Course DLBDSIPWP01: Introduction to Programming with Python .......... 199

Module DLBSEPPSD_E: Project: Software Development
Module Description .......................................................... 203
Course DLBSEPPSD01_E: Project: Software Development .............. 205

Module DLBSEWIMG_E: Mathematics Basics
Module Description .......................................................... 209
Course DLBCSM101: Mathematics I ...................................... 211
Course DLBCSM201: Mathematics II .................................... 215

Module DLBSEWMLAA_E: Mathematics: Linear Algebra and Analysis
Module Description ............................................................ 219
Course DLBDSMFLA01: Mathematics: Linear Algebra .......... 221
Course DLBDSMFC01: Mathematics: Analysis .................. 224

Module DLBSEWSG_E: Statistics Basics
Module Description ............................................................ 227
Course DLBDSSPD501: Statistics: Probability and Descriptive Statistics ..................................................... 229
Course DLBDSIS01: Statistics - Inferential Statistics ........... 233

Module DLBSEWDSSP_E: Data Science and object oriented programming with Python
Module Description ............................................................ 237
Course DLBDSIDS01: Introduction to Data Science ............ 239
Course DLBDSOOFPP01: Object oriented and functional programming in Python ................................. 242

Module DLBSEWITES_E: Internet of Things and Embedded Systems
Module Description ............................................................ 245
Course DLBINGEIT01_E: Introduction to the Internet of Things ..................................................... 247
Course DLBROES01_E: Embedded Systems ......................... 251

Module DLBSEWIR01_E: Robotics and Production Engineering
Module Description ............................................................ 255
Course DLBROIR01_E: Introduction to Robotics ................. 258
Course DLBDSEAR01: Production Engineering ..................... 262

Module DLBSEWIML_E: International Management and Leadership
Module Description ............................................................ 267
Course BWINT01: International Management ..................... 270
Course DLBWPS01_E: Leadership 4.0 ................................. 274

Module DLBDSEIMB: International Marketing and Branding
Module Description ............................................................ 279
Course DLBDSEIMB01: International Marketing ............... 282
Course DLBDSEIMB02: International Brand Management ...... 287

Module DLBDSEAS: Applied Sales
Module Description ............................................................ 293
Course DLBDSEAS01: Applied Sales I ............................. 296
Course DLBDSEAS02: Applied Sales II ............................. 300

Module DLBDSESCM: Supply Chain Management
Module Description ............................................................ 305
Course DLBDSESCM01: Supply Chain Management I ........ 308
Course DLBDSESCM02: Supply Chain Management II ........ 313

Module DLBDSEFSM: Financial Services Management
6. Semester

**Module DLBSEWLG_E: Mathematics Basics**
Module Description .................................................. 319
Course DLBCSM101: Mathematics I .................................. 333
Course DLBCSM201: Mathematics II ................................ 337

**Module DLBSEWMMLA_E: Mathematics: Linear Algebra and Analysis**
Module Description .................................................. 341
Course DLBDSMFLA01: Mathematics: Linear Algebra .............. 343
Course DLBDSMFC01: Mathematics: Analysis ..................... 346

**Module DLBSEWLSG_E: Statistics Basics**
Module Description .................................................. 349
Course DLBDSSPDS01: Statistics: Probability and Descriptive Statistics .................................................. 351
Course DLBDSSIS01: Statistics - Inferential Statistics .............. 355

**Module DLBSEWDSPPP_E: Data Science and object oriented programming with Python**
Module Description .................................................. 359
Course DLBDSDIDS01: Introduction to Data Science ................. 361
Course DLBDSSOFPFP01: Object oriented and functional programming in Python .................................................. 364

**Module DLBSEWITES_E: Internet of Things and Embedded Systems**
Module Description .................................................. 367
Course DLBINGEIT01_E: Introduction to the Internet of Things .... 369
Course DLBROES01_E: Embedded Systems ......................... 373

**Module DLBSEWIRI_E: Robotics and Production Engineering**
Module Description .................................................. 377
Course DLBROIR01_E: Introduction to Robotics .................... 380
Course DLBDSEAR01: Production Engineering ...................... 384

**Module DLBSEWIML_E: International Management and Leadership**
Module Description .................................................. 389
Course BWINT01: International Management ......................... 392
Course DLBWPLS01_E: Leadership 4.0 ............................... 396

**Module DLBDSEIMB: International Marketing and Branding**
Module Description .................................................. 401
Course DLBDSEIMB01: International Marketing .................... 404
Module DLBDSEIMB: International Brand Management
Module Description
Course DLBDSEIMB02: International Brand Management

Module DLBDSEAS: Applied Sales
Module Description
Course DLBDSEAS01: Applied Sales I
Course DLBDSEAS02: Applied Sales II

Module DLBDSESCM: Supply Chain Management
Module Description
Course DLBDSESCM01: Supply Chain Management I
Course DLBDSESCM02: Supply Chain Management II

Module DLBDSEFSM: Financial Services Management
Module Description
Course DLBDSEFSM01: Financial Services Management I
Course DLBDSEFSM02: Financial Services Management II

Module DLBCSEBI: Business Intelligence
Module Description
Course DLBCSEBI01: Business Intelligence
Course DLBCSEBI02: Project: Business Intelligence

Module DLBINGSD: Smart Devices
Module Description
Course DLBINGSD01: Smart Devices I
Course DLBINGSD02: Smart Devices II

Module DLBDSESF: Smart Factory
Module Description
Course DLBDSESF01: Smart Factory I
Course DLBDSESF02: Smart Factory II

Module DLBINGSM: Smart Mobility
Module Description
Course DLBINGSM01: Smart Mobility I
Course DLBINGSM02: Smart Mobility II

Module DLBINGSS: Smart Services
Module Description
Course DLBINGSS01: Smart Services I
Course DLBINGSS02: Smart Services II

Module DLBCSEEISC: IT Security Consulting
Module Description
Course DLBCSEEISC01: Technical and Operational IT Security Concepts
<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
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<tbody>
<tr>
<td>DLBCSEEISC02_E</td>
<td>Project: Configuration and Application of SIEM Systems</td>
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<td>Business Consulting</td>
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<td>Augmented, Mixed and Virtual Reality</td>
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<tr>
<td>DLBMIAMVR01_E</td>
<td>Augmented, Mixed and Virtual Reality</td>
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<td>DLBMIAMVR02_E</td>
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<td>DLBBWWDM_E</td>
<td>Digital Business</td>
</tr>
<tr>
<td>Module Description</td>
<td>517</td>
</tr>
<tr>
<td>DLWBLODB01_E</td>
<td>Digital Business Models</td>
</tr>
<tr>
<td>DLBINGDT01_E</td>
<td>Project: Design Thinking</td>
</tr>
<tr>
<td>DLBSEWIO_E</td>
<td>Infrastructure and Operations</td>
</tr>
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<td>527</td>
</tr>
<tr>
<td>DLBSWEO01_E</td>
<td>IT Operations Management</td>
</tr>
<tr>
<td>DBCSPITSM01_E</td>
<td>Project: IT Service Management</td>
</tr>
<tr>
<td>DLBDSEAIS_E</td>
<td>AI Specialist</td>
</tr>
<tr>
<td>Module Description</td>
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</tr>
<tr>
<td>DLBDSEAIS01_E</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>DLBDSEAIS02_E</td>
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1. Semester
Software Engineering Principles
Module Code: IGIS_E

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<th>Admission Requirements</th>
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Module Coordinator
Prof. Dr. Marian Benner-Wickner (Software Engineering Principles)

Contributing Courses to Module
- Software Engineering Principles (IGIS01_E)

Module Exam Type

<table>
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Weight of Module
see curriculum

Module Contents
- binary system
- Structure and function of computer systems
- Structure and function of communication networks
- Software life cycle
- Roles, phases, activities in software engineering
Learning Outcomes

Software Engineering Principles

On successful completion, students will be able to

- students can perform simple calculations in the binary system (Boolean algebra).
- students can describe the structure of computer systems and communication networks.
- students can distinguish between the phases of a SW life cycle.
- students can distinguish roles and phases in the software process.
- the students know different process models of SW development.
- the students know typical challenges and risks of enterprise SW development.
- the students know different programming paradigms and their application.

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 IU International University of Applied Sciences

All Bachelor Programs in the IT & Technology fields
Software Engineering Principles
Course Code: IGIS01_E

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Course Description
The aim of the course is to give students an insight into the technical and theoretical basics of software engineering. In addition to the general structure of computer systems, students are taught typical challenges in the development of enterprise information systems. Furthermore, the typical phases and activities in software engineering are presented to address these risks.

Course Outcomes
On successful completion, students will be able to

- students can perform simple calculations in the binary system (Boolean algebra).
- students can describe the structure of computer systems and communication networks.
- students can distinguish between the phases of a SW life cycle.
- students can distinguish roles and phases in the software process.
- the students know different process models of SW development.
- the students know typical challenges and risks of enterprise SW development.
- the students know different programming paradigms and their application.

Contents
1. Structure and organization of information systems
   1.1 0 and 1 as the basis of all IT systems
   1.2 Von Neumann Architecture
   1.3 Distributed systems and communication networks
   1.4 Enterprise information systems

2. Risks and challenges of enterprise software engineering
   2.1 Properties of enterprise software systems
   2.2 Software Engineering
   2.3 Risks and typical problems
   2.4 Root cause analysis
   2.5 Challenges in Software Engineering
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>3.</td>
<td>Software life cycle: from planning to replacement</td>
</tr>
<tr>
<td>3.1</td>
<td>The software life cycle at a glance</td>
</tr>
<tr>
<td>3.2</td>
<td>Planning</td>
</tr>
<tr>
<td>3.3</td>
<td>Development</td>
</tr>
<tr>
<td>3.4</td>
<td>Operation</td>
</tr>
<tr>
<td>3.5</td>
<td>Maintenance</td>
</tr>
<tr>
<td>3.6</td>
<td>Shutdown</td>
</tr>
<tr>
<td>4.</td>
<td>Requirements engineering and specification</td>
</tr>
<tr>
<td>4.1</td>
<td>Requirements engineering</td>
</tr>
<tr>
<td>4.2</td>
<td>Specification</td>
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<tr>
<td>5.</td>
<td>Architecture and implementation</td>
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<tr>
<td>5.1</td>
<td>Architecture</td>
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<td>5.2</td>
<td>Implementation</td>
</tr>
<tr>
<td>6.</td>
<td>Testing, operation and evolution</td>
</tr>
<tr>
<td>6.1</td>
<td>Testing</td>
</tr>
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<td>6.2</td>
<td>Operation</td>
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<td>Evolution</td>
</tr>
<tr>
<td>7.</td>
<td>Roles in Software Engineering</td>
</tr>
<tr>
<td>7.1</td>
<td>Idea of the role-based approach</td>
</tr>
<tr>
<td>7.2</td>
<td>Typical roles</td>
</tr>
<tr>
<td>8.</td>
<td>Organization of software projects</td>
</tr>
<tr>
<td>8.1</td>
<td>From process paradigm towards software process</td>
</tr>
<tr>
<td>8.2</td>
<td>Process Paradigms</td>
</tr>
<tr>
<td>9.</td>
<td>Software Process Frameworks</td>
</tr>
<tr>
<td>9.1</td>
<td>V-model XT</td>
</tr>
<tr>
<td>9.2</td>
<td>Rational Unified Process (RUP)</td>
</tr>
<tr>
<td>9.3</td>
<td>Scrum</td>
</tr>
<tr>
<td>Literature</td>
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<td>Compulsory Reading</td>
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# Study Format Distance Learning

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## Information about the examination

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## Student Workload

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<td>30 h</td>
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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed

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# Introduction to Academic Work

**Module Code:** DLBCSIAW

<table>
<thead>
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<td>WiSe/SoSe</td>
<td>English</td>
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**Module Coordinator**

Prof. Dr. Maya Stagge (Introduction to Academic Work)

**Contributing Courses to Module**

- Introduction to Academic Work (DLBCSIAW01)

**Module Exam Type**

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**Weight of Module**

see curriculum

**Module Contents**

- Scientific Theoretical Foundations and Research Paradigms
- Application of Good Scientific Practice
- Methodology
- Librarianship: Structure, Use, and Literature Management
- Forms of Scientific Work at IUBH

www.iu.org
Learning Outcomes

Introduction to Academic Work
On successful completion, students will be able to

▪ understand and apply formal criteria of a scientific work.
▪ distinguish basic research methods and identify criteria of good scientific practice.
▪ describe central scientific theoretical basics and research paradigms and their effects on scientific research results.
▪ use literature databases, literature administration programs, and other library structures properly; avoid plagiarism; and apply citation styles correctly.
▪ apply the evidence criteria to scientific texts.
▪ define a research topic and derive a structure for scientific texts.
▪ compile a list of literature, illustrations, tables, and abbreviations for scientific texts.
▪ understand and distinguish between the different forms of scientific work at IU.

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 IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management field
Introduction to Academic Work

Course Code: DLBCSIAW01

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Course Description

The application of good scientific practice is one of the basic academic qualifications that should be acquired while studying. This course deals with the distinction between everyday knowledge and science. This requires a deeper understanding of the theory of science, as well as the knowledge of basic research methods and instruments for writing scientific texts. The students therefore gain initial insight into academic research and are introduced to the basic knowledge that will help them in the future to produce scientific papers. In addition, the students receive an overview of the different IU examination forms and insight into their requirements and implementation.

Course Outcomes

On successful completion, students will be able to

- understand and apply formal criteria of a scientific work.
- distinguish basic research methods and identify criteria of good scientific practice.
- describe central scientific theoretical basics and research paradigms and their effects on scientific research results.
- use literature databases, literature administration programs, and other library structures properly; avoid plagiarism; and apply citation styles correctly.
- apply the evidence criteria to scientific texts.
- define a research topic and derive a structure for scientific texts.
- compile a list of literature, illustrations, tables, and abbreviations for scientific texts.
- understand and distinguish between the different forms of scientific work at IU.

Contents

1. Theory of Science
   1.1 Introduction to Science and Research
   1.2 Research Paradigms
   1.3 Fundamental Research Decisions
   1.4 Effects of Scientific Paradigms on Research Design
2. Application of Good Scientific Practice
   2.1 Research Ethics
   2.2 Evidence Teaching
   2.3 Data Protection and Affidavit
   2.4 Orthography and Shape
   2.5 Identification and Delimitation of Topics
   2.6 Research Questions and Structure

3. Research Methods
   3.1 Empirical Research
   3.2 Literature and Reviews
   3.3 Quantitative Data Collection
   3.4 Qualitative Data Collection
   3.5 Mix of Methods
   3.6 Critique of Methods and Self-Reflection

4. Librarianship: Structure, Use, and Literature Management
   4.1 Plagiarism Prevention
   4.2 Database Research
   4.3 Literature Administration
   4.4 4.4 Citation and Author Guidelines
   4.5 4.5 Bibliography

5. Scientific Work at the IU – Research Essay
6. Scientific Work at the IU - Project Report
7. Scientific Work at the IU - Case Study
8. Scientific Work at the IU - Bachelor Thesis
9. Scientific Work at the IU – Oral Assignment
10. Scientific Work at the IU – Oral Project Report
11. Scientific Work at the IU - Colloquium
12. Scientific Work at the IU - Portfolio
13. Scientific Work at the IU - Exam
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**Instructional Methods**

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## Requirements Engineering

**Module Code:** DLBCSRE

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### Module Coordinator
Prof. Dr. Tobias Brückmann (Requirements Engineering)

### Contributing Courses to Module
- Requirements Engineering (DLBCSRE01)

### Module Exam Type

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### Weight of Module
see curriculum

### Module Contents
- Basics of requirements engineering
- Enterprise modeling
- Requirement determination techniques
- Techniques of requirements documentation
- Testing and coordination of requirements
- Managing requirements
Learning Outcomes
Requirements Engineering
On successful completion, students will be able to
- describe models of enterprise modeling relevant to IT support and have experience in modeling.
- understand techniques and methods for determining requirements of IT systems and be able to distinguish them from each other.
- understand techniques for the documentation of requirements on IT systems and have experience in their use.
- describe techniques for testing, coordinating, and managing the requirements of IT systems and be able to distinguish between them.
- independently select suitable techniques and methods of requirements engineering for given project situations.

Links to other Modules within the Study Program
This module is similar to other modules in the field(s) of Computer Science & Software Development.

Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the IT & Technology field(s).
Requirements Engineering  
Course Code: DLBCSRE01  

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**Course Description**

The early phases of software development are largely characterized by the fact that functional and technical requirements for the IT system have to be determined. The determination of these requirements must be carried out extremely carefully because all of the following activities in the SW development process are planned and executed on the basis of documented requirements. In this course, procedures, methods, and models are covered, which make it possible to have a structured and methodical determination and documentation of requirements for operational information systems.

**Course Outcomes**

On successful completion, students will be able to

- describe models of enterprise modeling relevant to IT support and have experience in modeling.
- understand techniques and methods for determining requirements of IT systems and be able to distinguish them from each other.
- understand techniques for the documentation of requirements on IT systems and have experience in their use.
- describe techniques for testing, coordinating, and managing the requirements of IT systems and be able to distinguish between them.
- independently select suitable techniques and methods of requirements engineering for given project situations.

**Contents**

1. Fundamentals and Terms of Requirements Engineering
   1.1 Requirements Engineering in the Software Process
   1.2 Core Activities in Requirements Engineering
   1.3 What is a Requirement?

2. Determination of Requirements
   2.1 Determination of the System Context
   2.2 Determination of the Sources of Requirements
   2.3 Selection of the Appropriate Investigative Techniques
   2.4 Determine Requirements Using Techniques
3. Selected Investigative Techniques
   3.1 Creativity Techniques
   3.2 Interview Techniques
   3.3 Observation Techniques
   3.4 Prototyping

4. Documentation of Requirements
   4.1 Activities for Documenting Requirements
   4.2 Typical Elements of Requirements Documentation
   4.3 Forms of Documentation

5. Modeling of Processes
   5.1 Basics and Terms
   5.2 Modeling with the Business Process Model and Notation
   5.3 Modeling with Event Driven Process Chains

6. Modeling of Systems
   6.1 Fundamentals of Unified Modeling Language
   6.2 UML Use Case Diagram
   6.3 UML Activity Diagram
   6.4 UML Class Diagram
   6.5 UML State Diagram

7. Checking and Reconciling Requirements
   7.1 Activities for Checking and Reconciling Requirements
   7.2 Test Criteria
   7.3 Test Principles
   7.4 Testing Techniques
   7.5 Coordination of Requirements

8. Management of Prioritization Requirements and Techniques
   8.1 Managing Requirements
   8.2 Techniques for Prioritizing Requirements
## Literature

### Compulsory Reading

### Further Reading

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# Specification

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**Module Coordinator**

Prof. Dr. Tobias Brückmann (Specification)

**Contributing Courses to Module**

- Specification (DLBCSS01)

**Module Exam Type**

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**Weight of Module**

see curriculum
Module Contents

- Basics of specification
- Specification of user interfaces (GUIs)
- Specification of components and their interfaces
- Technical specification of detailed technical data models
- Specification of business rules
- Specification of data interfaces
- Specification of web services
- Specification of quality and limiting constraints

Learning Outcomes

Specification

On successful completion, students will be able to

- know the motivation, use cases, and scenarios for the practical use of technical specifications.
- distinguish techniques from each other for the detailed specification of application interfaces and business logic of information systems and have experience with their use.
- identify and independently specify business objects and components.
- describe techniques for the detailed specification of technical interfaces between IT systems and be able to specify interfaces independently.
- explain techniques and procedures for the technical specification of quality properties and limiting conditions.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field(s).
Course Code: DLBCSS01

Course Description
Based on the results of the technical requirements analysis, requirements for IT systems must be described as precisely as is appropriate for the respective situation. Based on specifications, project costs are estimated, and decisions are made about the internal design of the system. In this course different models and techniques that are used for the detailed specification of requirements for a system, subsystem, or system component are taught. The structure of the course is based on the structure of typical business information systems. In addition to the application layers, user interface, business logic, and data layer, the specification of web services is also covered.

Course Outcomes
On successful completion, students will be able to

- know the motivation, use cases, and scenarios for the practical use of technical specifications.
- distinguish techniques from each other for the detailed specification of application interfaces and business logic of information systems and have experience with their use.
- identify and independently specify business objects and components.
- describe techniques for the detailed specification of technical interfaces between IT systems and be able to specify interfaces independently.
- explain techniques and procedures for the technical specification of quality properties and limiting conditions.

Contents
1. Introduction to the Specification of Software Systems
   1.1 Basics and Terms for Specification
   1.2 Elements and Outlines of Specifications
   1.3 Structures and Forms of Documentation for Specification

2. Specification of User Interfaces (GUIs)
   2.1 Elements of a GUI Specification
   2.2 GUI Elements in Individual Dialog Masks
   2.3 Validations
   2.4 Navigation Between Dialogue Masks
3. Specification of System Components
   3.1 Introduction and Motivation for Components
   3.2 Specifying the Structure of Systems and Components
   3.3 Specification of Component Behavior

4. Specification of Technical System Interfaces
   4.1 Specifying Behavior at Interfaces of Components
   4.2 Data Structures at Interfaces of Components

5. Specification of Detailed Business Data Models
   5.1 Areas of Application of Technical Data Models
   5.2 Detailing the UML Class Diagram
   5.3 Checking Class Diagrams with UML Object Diagrams
   5.4 Typical Elements in Domain-Oriented Data Models

6. Specification of Data Interfaces with Structured Text
   6.1 Structured Text as Exchange Format
   6.2 Structure and Structure of XML Documents
   6.3 Definition of XML Languages
   6.4 Derivation of Class Diagrams From XML formats
   6.5 Specifying Web Services with WSDL

7. Specification of Quality Properties
   7.1 Quality and Quality Models
   7.2 Goal/Question/Metric Method (GQM)
### Literature

#### Compulsory Reading

#### Further Reading

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# Object-oriented Programming with Java

**Module Code:** DLBCSOOPJ

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**Module Coordinator**

Prof. Dr. Damir Ismailovic (Object-oriented Programming with Java)

**Contributing Courses to Module**

- Object-oriented Programming with Java (DLBCSOOPJ01)

**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**

- Introduction to the Java language
- Java language constructs
- Introduction to object-oriented system development
- Inheritance
- Object-oriented concepts
- Exception handling
- Interfaces
### Learning Outcomes

**Object-oriented Programming with Java**

On successful completion, students will be able to

- describe the basic concepts of object-oriented modeling and programming, distinguishing them from one another.
- describe the basic concepts and elements of the Java programming language and have some experience in their use.
- independently create Java programs to solve concrete problems.

### Links to other Modules within the Study Program

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

### Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field(s).
Object-oriented Programming with Java

Course Code: DLBCSOOPJ01

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**Course Description**
Operational information systems are usually planned and programmed to be object-oriented. Therefore, this course teaches the basic skills of object-oriented programming. Theoretical concepts are presented and practiced directly with the programming language Java.

**Course Outcomes**
On successful completion, students will be able to
- describe the basic concepts of object-oriented modeling and programming, distinguishing them from one another.
- describe the basic concepts and elements of the Java programming language and have some experience in their use.
- independently create Java programs to solve concrete problems.

**Contents**
1. Introduction to Object-Oriented System Development
   1.1 Object Orientation as a Way of Looking at Complex Systems
   1.2 The Object as a Basic Concept of Object Orientation
   1.3 Phases in the Object-Oriented Development Process
   1.4 Basic Principle of Object-Oriented System Development
2. Introduction to Object-Oriented Modeling
   2.1 Structuring Problems With Classes
   2.2 Identifying Classes
   2.3 Attributes as Properties of Classes
   2.4 Methods as Functions of Classes
   2.5 Associations between Classes
   2.6 Unified Modeling Language (UML)
3. Programming Classes in Java
   3.1 Introduction to the Java Programming Language
   3.2 Basic Elements of a Class in Java
   3.3 Attributes in Java
   3.4 Methods in Java
   3.5 Main Method: Starting Point of a Java Program

4. Java Language Constructs
   4.1 Primitive Data Types
   4.2 Variables
   4.3 Operators and Expressions
   4.4 Control Structures
   4.5 Packages and Visibility Modifiers

5. Inheritance
   5.1 Modeling and Inheritance in the Class Diagram
   5.2 Programming Inheritance in Java

6. Important Object-Oriented Concepts
   6.1 Abstract Classes
   6.2 Polymorphism
   6.3 Static Attributes and Methods

7. Constructors for Generating Objects
   7.1 The Standard Constructor
   7.2 Overloading Constructors
   7.3 Constructors and Inheritance

8. Handling Exceptions with Exceptions
   8.1 Typical Scenarios of Exception Handling
   8.2 Standard Exceptions in Java
   8.3 Defining Your Own Exceptions

9. Programming Interfaces with Interfaces
   9.1 Typical Scenarios of Programming Interfaces
   9.2 Interfaces as Programming Interfaces in Java
### Literature

#### Compulsory Reading

**Further Reading**

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## Instructional Methods

- [ ] Learning Sprints®
- ✔ Course Book
- [ ] Vodcast
- ✔ Shortcast
- ✔ Audio
- ✔ Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- ✔ Live Tutorium/Course Feed
### Study Format Distance Learning

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# Database Modeling and Database Systems

**Module Code:** DLBCSDMDS

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**Module Coordinator**

Prof. Dr. Ralf Kneuper (Database Modeling and Database Systems)

**Contributing Courses to Module**

- Database Modeling and Database Systems (DLBCSDMDS01)

**Module Exam Type**

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**Weight of Module**

see curriculum

**Module Contents**

- Fundamentals of relational databases
- Simple database queries
- Entity/Relationship (E/R) Diagrams
- database development
- Complex database queries across multiple tables
- Changing data in databases
- NoSQL database systems
Learning Outcomes

Database Modeling and Database Systems
On successful completion, students will be able to
- describe the basic concepts of the relational data model and distinguish them from each other.
- visually model data schemas.
- know SQL queries, read data from databases, change the data stock, and have experience in their use.
- design, create, and modify SQL queries and data schemas for SQL databases, and have experience using them.
- independently design database schemas and create database queries to solve concrete problems.
- know the most important NoSQL concepts and distinguish them from each other.

Links to other Modules within the Study Program
This module is similar to other modules in the field(s) of Computer Science & Software Development

Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the IT & Technology field(s).
Database Modeling and Database Systems
Course Code: DLBCSDMDS01

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Course Description
Stored data form the basis of many value chains of an information and knowledge society. The methodical structuring of data through data schemas therefore forms an important basis for storing information in such a way that it can be retrieved and processed quickly and easily. In addition to the structured storage of data, structured access to large amounts of data must also be possible. This course teaches students how to store data in relational data models and how to access stored data with SQL. In addition to relational database systems, modern DB systems (NoSQL) for storing and accessing data will be presented.

Course Outcomes
On successful completion, students will be able to
- describe the basic concepts of the relational data model and distinguish them from each other.
- visually model data schemas.
- know SQL queries, read data from databases, change the data stock, and have experience in their use.
- design, create, and modify SQL queries and data schemas for SQL databases, and have experience using them.
- independently design database schemas and create database queries to solve concrete problems.
- know the most important NoSQL concepts and distinguish them from each other.

Contents
1. Fundamentals of Relational Databases
   1.1 Basic Concepts of the Relational Data Model
   1.2 Find and Delete Records in the Database
   1.3 SQL and Relational Database Systems

2. Querying Data from a Single Table
   2.1 Query Data (SELECT)
   2.2 Query Data With Condition (WHERE)
   2.3 Sort Query Output (ORDER BY)
   2.4 Queries With Group Formation (GROUP BY)
   2.5 Subqueries With Nested SELECT Statements
3. Conception and Modeling of Relational Databases
   3.1 The Entity Relationship Model
   3.2 Relationships and Cardinalities in E/R Models
   3.3 Normal Forms of Databases

4. Creation of Relational Databases
   4.1 Logical Database Design Activities
   4.2 Mapping of the Conceptual Data Model into the Physical Data Model
   4.3 Generation of Tables in SQL Databases from E/R Diagrams

5. Complex Database Queries on Multiple Tables
   5.1 Composite Quantities (JOIN)
   5.2 Set Operations
   5.3 Data Views With CREATE VIEW

6. Manipulating Records in Databases
   6.1 Insert New Data Records (INSERT)
   6.2 Change Existing Records
   6.3 Transactions

7. NoSQL Database Systems
   7.1 Motivation and Basic Idea
   7.2 Selected Groups of NoSQL Systems

---

**Literature**

**Compulsory Reading**

**Further Reading**

- Date, C.J. (2019). Database design and relational theory: Normal forms and all that jazz (2nd ed.). Apress.
- Documentation of Mondial Database (2010). Mondial Database.
### Study Format myStudies

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- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
2. Semester
# Data structures and Java class library

**Module Code:** DLBCSDSJCL

## Module Type
- see curriculum

## Admission Requirements
- none

## Study Level
- BA
- CP 5

## Student Workload
- 150 h

## Semester / Term
- see curriculum

## Duration
- Minimum 1 semester

## Regularly offered in
- WiSe/SoSe

## Language of Instruction
- English

## Module Coordinator
- Prof. Dr. Damir Ismailovic (Data structures and Java class library)

## Contributing Courses to Module
- Data structures and Java class library (DLBCSDSJCL01)

## 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
- Programming style
- Working with objects
- External packages and libraries
- Data structures
- Strings and calendar
- File system and data streams
Learning Outcomes

Data structures and Java class library

On successful completion, students will be able to

▪ understand typical data structures and distinguish them from each other.
▪ independently create solutions in the Java programming language using the data structures.
▪ understand scenarios and strategies for comparing objects and implement them in Java.
▪ describe the possible uses and functions of character strings and calendar objects in Java
  and have experience using them.
▪ describe the possible uses and functions of streams in Java and have experience using them.

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 IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology fields
Course Description

Based on the contents of the course "Basics of object-oriented programming with Java", this course deepens the knowledge of object-oriented programming. In particular, data structures, their use cases, and their implementation in the Java language are considered. In addition, strategies and scenarios of object comparisons, the use of functions of the "String" data type, the use of calendar objects, and the use of streams are taught.

Course Outcomes

On successful completion, students will be able to

- understand typical data structures and distinguish them from each other.
- independently create solutions in the Java programming language using the data structures.
- understand scenarios and strategies for comparing objects and implement them in Java.
- describe the possible uses and functions of character strings and calendar objects in Java and have experience using them.
- describe the possible uses and functions of streams in Java and have experience using them.

Contents

1. Programming Style
   1.1 Code Documentation
   1.2 Code Annotations
   1.3 Code Conventions

2. Working with Objects
   2.1 String Representation of Objects
   2.2 Compare with ==
   2.3 Compare with Equals()
   2.4 Compare by HashCode()
   2.5 CompareTo()
   2.6 Cloning Objects

3. External Packages and Libraries
   3.1 Importing Packages
   3.2 The Java Class Library
4. Data Structures
   4.1 Arrays
   4.2 Collections
   4.3 Working with Collections
   4.4 Lists
   4.5 Quantities (Sets)
   4.6 Associative Memory (Maps)
   4.7 Stacks (Basement)
   4.8 Queues (Snakes)

5. Strings and Calendar
   5.1 Strings
   5.2 StringBuffer
   5.3 Splitting Character Strings
   5.4 Date and time
   5.5 Calendar

6. File System and Data Streams
   6.1 Working with the File System
   6.2 Working with Files

Literature

Compulsory Reading

Further Reading
### Study Format myStudies

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### Instructional Methods

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**Collaborative Work**  
*Module Code: DLBCSCW*

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**Module Coordinator**  
Prof. Dr. Karin Halbritter (Collaborative Work)

**Contributing Courses to Module**

- Collaborative Work (DLBCSCW01)

**Module Exam Type**

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Oral Assignment |
| Study Format: Distance Learning  
Oral Assignment |

**Weight of Module**

see curriculum

**Module Contents**

- Self-Directed and Collaborative Learning
- Networking and Cooperation
- Performance in (Virtual) Teams
- Communication, Arguments, and Being Convincing
- Potentials for Conflict and Managing Conflicts
- Self-Management and Personal Skills
**Learning Outcomes**

**Collaborative Work**

On successful completion, students will be able to

- design their own learning processes both self-directed and collaborative with analog and digital media.
- initiate face-to-face and virtual cooperation and select suitable methods for shaping collaboration even in an intercultural context and across disciplinary boundaries.
- assess different forms of communication in relation to the goals and requirements of different situations and to reflect on their own communication and argumentation behavior in order to be able to shape conducive collaboration also in an interdisciplinary context.
- recognize social diversity including cultural and professional differences as a value, and to name and apply tools to deal with them constructively.
- explain conflict potentials and the role of emotions in conflicts and to describe the use of systemic methods in the target- and solution-oriented handling of conflicts.
- analyze one’s own resources, present methods of self-leadership and self-motivation, and derive appropriate strategies.

**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 IU International University of Applied Sciences**

All Bachelor Programmes in the Business & Management fields
Collaborative Work

Course Code: DLBCSCW01

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Course Description

The course supports the students in building up and expanding important interdisciplinary competences for our networked world, and in doing so, students can take advantage of the opportunities for constructive cooperation with others. It presents essential forms and design possibilities of collaborative learning and working, imparts basic knowledge and tools for self-managed, flexible, and creative thinking, learning and acting and familiarizes students with the topics of empathy and emotional intelligence. Students are also encouraged to use the course contents. In this way, they promote their autonomous competence to act and their competence in the interactive application of tools and in interacting in heterogeneous groups.

Course Outcomes

On successful completion, students will be able to

- design their own learning processes both self-directed and collaborative with analog and digital media.
- initiate face-to-face and virtual cooperation and select suitable methods for shaping collaboration even in an intercultural context and across disciplinary boundaries.
- assess different forms of communication in relation to the goals and requirements of different situations and to reflect on their own communication and argumentation behavior in order to be able to shape conducive collaboration also in an interdisciplinary context.
- recognize social diversity including cultural and professional differences as a value, and to name and apply tools to deal with them constructively.
- explain conflict potentials and the role of emotions in conflicts and to describe the use of systemic methods in the target- and solution-oriented handling of conflicts.
- analyze one’s own resources, present methods of self-leadership and self-motivation, and derive appropriate strategies.

Contents

1. Learning for a Networked World in a Networked World
   1.1 Requirements and Opportunities of the VUCA World
   1.2 Learning, Information, and Dealing with Knowledge and Ignorance
   1.3 C-Model: Collective – Collaborative – Continuous – Connected
   1.4 Checking Your Own Learning Behaviour
2. Networking and Cooperation
   2.1 Finding and Winning Suitable Cooperation Partners
   2.2 Sustainable Relationships: Digital Interaction and Building Trust
   2.3 Collaboration: Organizing Locally and Virtually and Using Media
   2.4 Social Learning: Agile, Collaborative, and Mobile Planning of Learning Processes

3. Performance in (Virtual) Teams
   3.1 Goals, Roles, Organization and Performance Measurement
   3.2 Team Building and Team Flow
   3.3 Scrum as a Framework for Agile Project Management
   3.4 Design Thinking, Kanban, Planning Poker, Working-in-Progress-Limits & Co

4. Communicate and Convince
   4.1 Communication as Social Interaction
   4.2 Language, Images, Metaphors, and Stories
   4.3 It’s the Attitude that Counts: Open, Empathetic, and Appreciative Communication
   4.4 Listen Actively - Argue - Convince - Motivate
   4.5 Analyze Your Own Conversational and Argumentational Skills

5. Recognize Conflict Potentials - Handle Conflicts - Negotiate Effectively
   5.1 Respecting Diversity - Seizing Opportunities
   5.2 Developing Empathy for Yourself and Others
   5.3 Systemic Work Solutions and Reframing
   5.4 Negotiate Constructively: Finding Clear Words - Interests Instead of Positions

6. Realize Your Own Projects
   6.1 Set Goals Effectively - Focus - Reflect
   6.2 The Agile Use of One’s Own Time
   6.3 (Self-)Coaching and Inner Team
   6.4 Strategies and Methods for Self-Management and Self-Motivation

7. Mobilize Your Resources
   7.1 Recognizing Resources - Regulating Emotions
   7.2 Reflection and Innovation - Lateral Thinking and Creativity
   7.3 Transfer Strength and Willpower: Analyzing and Controlling Condition Factors
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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Web Application Development
Module Code: DLBCSWAD

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Module Coordinator
Prof. Dr. André Hollstein (Web Application Development)

Contributing Courses to Module
- Web Application Development (DLBCSWAD01)

Module Exam Type

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Weight of Module
see curriculum

Module Contents
- Architectural Foundations
- Tools of web development
- HTML
- CSS
- Javascript
- Web application testing and security
## Learning Outcomes

**Web Application Development**

On successful completion, students will be able to

- identify important elements and describe the structure of current web application architectures.
- write simple static web pages using HTML.
- design simple web pages using CSS.
- store and handle structured information using XML.
- program simple dynamic web content using PHP.

## 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 IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field.
Course Description
This course aims to empower students to program simple web applications using established technologies. At first, they will gain important insights into the typical structure of current web application architectures. Based on that knowledge, the students will learn the hypertext markup language (HTML) to develop simple web pages. Next, they will familiarize themselves with the most important and common elements of the cascading stylesheet (CSS) standard to layout the content written in HTML. To implement simple dynamic web pages, students learn how to use Javascript and exemplary supporting frameworks. This is combined with the use of relevant tools for the development and source code management of web pages. Finally, they will learn the very basics of the web page testing and security.

Course Outcomes
On successful completion, students will be able to
- identify important elements and describe the structure of current web application architectures.
- write simple static web pages using HTML.
- design simple web pages using CSS.
- store and handle structured information using XML.
- program simple dynamic web content using PHP.

Contents
1. Architectural Foundations
   1.1 Structure and History of the Internet
   1.2 Internet protocols and URIs
   1.3 Web application architecture
   1.4 Current trends

2. Tools of web development
   2.1 Development Tools
   2.2 Version management
   2.3 Package Manager
   2.4 Upload/Deployment
3. Static web pages development
   3.1 Fundamentals of HTML5
   3.2 Fundamentals of CSS

4. Advanced design techniques
   4.1 Responsive web design
   4.2 Page layout
   4.3 Media queries
   4.4 CSS Frameworks

5. Web page development with JavaScript
   5.1 JavaScript history, ES5/ES6
   5.2 JavaScript fundamentals
   5.3 Use of JSON
   5.4 Common JavaScript Frameworks

6. Web application testing and security
   6.1 Testing of web applications
   6.2 Basic security concepts and principles

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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| Type of Exam | Workbook |

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- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
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- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed

www.iu.org
# Study Format myStudies

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# Algorithms, Data Structures, and Programming Languages

**Module Code:** DLBCSL

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**Module Coordinator**

Prof. Dr. Paul Libbrecht (Algorithms, Data Structures, and Programming Languages)

**Contributing Courses to Module**

- Algorithms, Data Structures, and Programming Languages (DLBCSL01)

**Module Exam Type**

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**Weight of Module**

see curriculum
## Module Contents

- Data structures
- Algorithm design
- Important algorithms
- Programming paradigms and the basic terms of programming languages
- Programme analysis tools
- Overview of common programming languages

## Learning Outcomes

### Algorithms, Data Structures, and Programming Languages

On successful completion, students will be able to

- explain basic data structures and compare and apply them in concrete applications.
- explain basic algorithms.
- design, select and apply suitable algorithms and data structures for specific applications
- analyse sketched or programmed algorithms when or before running them
- explain and compare the common programming paradigms and programming languages.

## Links to other Modules within the Study Program

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

## Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field(s).
Algorithms, Data Structures, and Programming Languages

Course Code: DLBCSL01

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Course Description
Programming essentially consists of selecting suitable algorithms and data structures for a specific task and converting them into program code. There are many different programming languages, which are based on different procedures and in which algorithms and data structures are implemented differently. In this module, these concepts, which have so far been dealt with using concrete examples, are systematically presented and applied more broadly in order to give students the necessary tools to develop a systematic approach to programming.

Course Outcomes
On successful completion, students will be able to

- explain basic data structures and compare and apply them in concrete applications.
- explain basic algorithms.
- design, select and apply suitable algorithms and data structures for specific applications
- analyse sketched or programmed algorithms when or before running them
- explain and compare the common programming paradigms and programming languages.

Contents
1. Basic Concepts
   1.1 Algorithms, Data Structures, and Programming Languages as the Basics of Programming
   1.2 Detailing and Abstraction
   1.3 Control Structures
   1.4 Types of Data
   1.5 Basic Data Structures (List, Chain, Tree)

2. Data Structures
   2.1 Advanced Data Structures: Queue, Heap, Stack, Graph
   2.2 Abstract Data Types, Objects, and Classes
   2.3 Polymorphism
3. Algorithm Design
   3.1 Induction, Iteration, and Recursion
   3.2 Methods of Algorithm Design
   3.3 Correctness and Verification of Algorithms
   3.4 Efficiency (complexity) of algorithms

4. Basic Algorithms
   4.1 Traversing and Linearization of Trees
   4.2 Search Algorithms
   4.3 Sorting Algorithms
   4.4 Search in Strings
   4.5 Hash Algorithms
   4.6 Pattern Recognition

5. Measuring Programmes
   5.1 Type inference and IDE interactive support
   5.2 Cyclomatic and referential complexity
   5.3 Digesting code documentation
   5.4 Compiler optimization
   5.5 Code coverage
   5.6 Unit and integration testing
   5.7 Heap analysis

6. Programming Languages
   6.1 Programming Paradigms
   6.2 Execution of Programs
   6.3 Types of Programming Languages
   6.4 Syntax, Semantics, and Pragmatics
   6.5 Variables and Type Systems

7. Overview of Important Programming Languages
   7.1 Assembler and Webassembly
   7.2 C and C++
   7.3 Java and C#
   7.4 Haskell and Lisp
   7.5 JavaScript and its relatives
   7.6 Other imperative programming languages
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- **Type of Exam**: Exam, 90 Minutes

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Software Quality Assurance
Module Code: DLBCSSQA

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Module Coordinator
Prof. Dr. Tobias Brückmann (Software Quality Assurance)

Contributing Courses to Module
- Software Quality Assurance (DLBCSSQA01)

Module Exam Type
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Exam, 90 Minutes | |

Weight of Module
see curriculum

Module Contents
- Systematic quality assurance of requirements, architectures, and processes
- Systematic testing of software
- Dynamic quality assurance: Testing
- Static quality assurance: Surveying and measuring
- Constructive quality management
- Organization and planning of software quality
- Introduction to software quality assurance
## Learning Outcomes

**Software Quality Assurance**

On successful completion, students will be able to

- understand motivation, use cases, and scenarios for aspects of quality management in the software process.
- understand important terms and the basis for the conception and execution of software tests.
- understand techniques and methods for constructive quality management and be able to distinguish them from each other.
- understand techniques and methods for analytical quality management and be able to distinguish them from one another.
- understand the general course of test activities and be able to select suitable methods and techniques for quality assurance for various artefacts and activities in the software process.

## Links to other Modules within the Study Program

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

## Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field(s).
Quality assurance is one of the accompanying activities of a software process. From the beginning, all created artefacts (documents, models, and program codes) must be quality-assured because the later an error in a system is detected, the more expensive it is to fix it. The course teaches techniques and procedures for accompanying quality assurance, starting with requirements analysis through to specification, architecture and design, and implementation. Even the quality assurance activities must be quality assured so that the software systems can be delivered at a good standard.

Course Outcomes
On successful completion, students will be able to

- understand motivation, use cases, and scenarios for aspects of quality management in the software process.
- understand important terms and the basis for the conception and execution of software tests.
- understand techniques and methods for constructive quality management and be able to distinguish them from each other.
- understand techniques and methods for analytical quality management and be able to distinguish them from one another.
- understand the general course of test activities and be able to select suitable methods and techniques for quality assurance for various artefacts and activities in the software process.

Contents
1. Introduction to Software Quality Assurance
   1.1 Motivation and Terms
   1.2 Principles of SW Quality Assurance
   1.3 Principles in Software Testing
   1.4 Cost of Quality

2. Organization and Planning of Software Quality
   2.1 Overview of the Quality Management Process
   2.2 Quality Planning and Quality Objectives
   2.3 Quality Assurance and Quality Improvement
   2.4 Quality Control
3. Constructive Quality Management
   3.1 Overview of Constructive Quality Assurance
   3.2 Selected Techniques

4. Static Quality Assurance: Surveying and Measuring
   4.1 Application and Overview of Static Processes
   4.2 Reviewing with Review Techniques
   4.3 Trade Fairs and Metrics
   4.4 Static Code Analysis

5. Dynamic Quality Assurance: Testing
   5.1 Deployment and an Overview of Dynamic Processes
   5.2 Use Case Based Test Case Creation
   5.3 Equivalence Class Formation and Limit Value Analysis
   5.4 State Based Test Case Creation
   5.5 Creation of Random Test Data

6. Systematic Testing of Software
   6.1 Methodological Testing Activities
   6.2 Component Test (Also: Module Test, Unit Test)
   6.3 Integration Tests
   6.4 System Tests
   6.5 Acceptance Tests

7. Systematic Quality Assurance of Requirements, Architectures, and Processes
   7.1 Quality Assurance of Requirements
   7.2 Quality Assurance of Architectures
   7.3 Quality Assurance of Software Processes
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- Live Tutorium/Course Feed
# IT Architecture Management

**Module Code:** IAMG_E

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**Module Coordinator**
Prof. Dr. Tobias Brückmann (IT Architecture Management)

**Contributing Courses to Module**
- IT Architecture Management (DLBCSEITPAM02)

**Module Exam Type**

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<td>Study Format: Distance Learning</td>
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**Weight of Module**
see curriculum

**Module Contents**
- Basic Terms and Foundations of IT Enterprise Architectures Management
- IT Application Portfolio Management
- Architecture Governance
- Modeling of IT Enterprise Architectures
- Frameworks using TOGAF as an Example
- Reference Models and Sample Catalogues
Learning Outcomes

IT Architecture Management

On successful completion, students will be able to

▪ describe and explain the basic principles of IT strategy, governance, and architecture management, differentiating between them.
▪ explain and differentiate the typical activities of IT architecture management, their interrelationships, and their dependencies.
▪ explain suitable models of IT architecture management, distinguish between them, and explain their intended purpose.
▪ explain and describe selected IT architectural frameworks as well as reference models and sample catalogues.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field.

www.iu.org
IT Architecture Management
Course Code: DLBCSEITPAM02

Study Level | Language of Instruction | Contact Hours | CP | Admission Requirements
--- | --- | --- | --- | ---
BA | English | 5 | none

Course Description
In addition to concrete IT projects, such as the development of a new IT system or the introduction of standard software, a strategic management system for organizational-wide IT infrastructure – that is, for all IT hardware and software systems – must be used. Strategic management is the responsibility of the IT enterprise architect, who operates IT architecture management. Their task is to strategically align IT infrastructure with an organization's business and IT strategy. This course covers the typical concepts, methods, procedures, and IT models of architecture management.

Course Outcomes
On successful completion, students will be able to
- describe and explain the basic principles of IT strategy, governance, and architecture management, differentiating between them.
- explain and differentiate the typical activities of IT architecture management, their interrelationships, and their dependencies.
- explain suitable models of IT architecture management, distinguish between them, and explain their intended purpose.
- explain and describe selected IT architectural frameworks as well as reference models and sample catalogues.

Contents
1. Basic Terms and Foundation for the Management of IT Enterprise Architectures
   1.1 IT Enterprise Architecture
   1.2 Goals of Enterprise Architecture Management
   1.3 Processes in the Management of IT Enterprise Architectures

2. IT Application Portfolio Management
   2.1 IT Application Portfolio Management Overview
   2.2 Application Manual
   2.3 Portfolio Analysis
   2.4 Development Planning
3. Architecture Governance
   3.1 Organizational Structure
   3.2 Policy Development and Enforcement
   3.3 Project Support

4. Modeling of IT Enterprise Architectures
   4.1 Models in the Context of IT Architecture Management
   4.2 Forms of Documentation for Processes and Applications
   4.3 Forms of Documentation for Systems and Technologies

5. Frameworks Using the Example of TOGAF
   5.1 Fundamentals and Use of IT Architecture Frameworks
   5.2 Overview and Categories of EAM Frameworks
   5.3 The Open Group Architecture Framework (TOGAF)

6. Reference Models and Sample Catalogues
   6.1 Architecture Reference Models
   6.2 EAM Design Sample Catalogue

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
3. Semester
### Programming Information Systems with Java EE

**Module Code:** IPWA2_E

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**Module Coordinator**
N.N. (Programming Information Systems with Java EE)

**Contributing Courses to Module**
- Programming Information Systems with Java EE (IPWA02_E)

**Module Exam Type**

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**Weight of Module**
see curriculum

**Module Contents**
- Programming of business logic
- Programming of database connections
Learning Outcomes

Programming Information Systems with Java EE

On successful completion, students will be able to

▪ explain and differentiate relevant technologies, standards and frameworks for the creation of business logic and database connectivity in enterprise web applications.
▪ use different web technologies to implement and integrate application interfaces, business logic and data layers.
▪ independently create suitable web applications to solve practical problems.

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 IU

International University of Applied Sciences

All Bachelor Programs in the IT & Technology fields
## Programming Information Systems with Java EE

**Course Code:** IPWA02_E

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### Course Description

This course focuses on the business logic and database connectivity of web applications, starting with extending simple web interfaces with functions for validating and converting inputs and creating error messages. As lowest layer of web applications, concepts and technologies for connecting to database systems are presented and applied.

### Course Outcomes

On successful completion, students will be able to

- explain and differentiate relevant technologies, standards and frameworks for the creation of business logic and database connectivity in enterprise web applications.
- use different web technologies to implement and integrate application interfaces, business logic and data layers.
- independently create suitable web applications to solve practical problems.

### Contents

1. Programming of Business Logic
   1.1 Validation of User Input
   1.2 Conversion of Numbers, Currencies and Dates
   1.3 Definition of Error Messages
   1.4 Page Navigation within JSF Applications
   1.5 JSF Life Cycle and Event Handling

2. Programming of Database Connections
   2.1 Persistent Storage in Databases
   2.2 Object Relational Mapping
   2.3 Database Persistence with JPA and Hibernate as Persistence Providers
   2.4 Creating Entities
   2.5 Associations Between Objects Using JPA
   2.6 Deleting Objects Using JPA
   2.7 Data Access Objects
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### Instructional Methods

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- Course Book
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- Guideline
- Live Tutorium/Course Feed

www.iu.org
**Study Format Distance Learning**

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**Type of Exam**

- Exam, 90 Minutes

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**Instructional Methods**

- ☐ Learning Sprints®
- ☑ Course Book
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- ☑ Shortcast
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- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
Ethics and Sustainability in IT

Module Code: DLBSEPENIT_E

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Module Coordinator

Prof. Dr. Marian Benner-Wickner (Ethics and Sustainability in IT)

Contributing Courses to Module

- Ethics and Sustainability in IT (DLBSEPENIT01_E)

Module Exam Type

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Weight of Module

see curriculum

Module Contents

- Introduction Ethics and Sustainability in IT
- Fundamentals of Ethics
- Establishment of Sustainable IT
- Social Sustainability
- Ecological Sustainability
- Ethical & Sustainable Issues on Case Studies
Learning Outcomes

Ethics and Sustainability in IT

On successful completion, students will be able to

▪ comprehend the motivation, solution approaches and challenges of sustainable information technology.
▪ understand the essential theories and concepts of building a sustainable information technology.
▪ understand the essential principles and methods for shaping the social and environmental dimensions of information technologies.
▪ comprehend the essential theories and concepts of ethics that are relevant to the critical reflection of ethical challenges needed in the context of information technologies including Artificial Intelligence.
▪ apply the knowledge acquired to analyze the social, environmental, and ethical challenges related to information technologies and develop responses to these.

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 IU International University of Applied Sciences

All Bachelor Programs in the IT & Technology field
Ethics and Sustainability in IT
Course Code: DLBSEPENIT01_E

Course Description
Sustainable management is playing an increasingly important role in business and society. Information Technologies (IT) also face the challenge of integrating ecological, social and ethical requirements in the development and use of systems. In this lecture, the main theories and concepts for building sustainable IT will be presented. After the general introduction, social, ecological and ethical basics and current examples are dealt with in depth, which can be used to discuss current issues and challenges.

Course Outcomes
On successful completion, students will be able to
- comprehend the motivation, solution approaches and challenges of sustainable information technology.
- understand the essential theories and concepts of building a sustainable information technology.
- understand the essential principles and methods for shaping the social and environmental dimensions of information technologies.
- comprehend the essential theories and concepts of ethics that are relevant to the critical reflection of ethical challenges needed in the context of information technologies including Artificial Intelligence.
- apply the knowledge acquired to analyze the social, environmental, and ethical challenges related to information technologies and develop responses to these.

Contents
1. Introduction to Ethics and Sustainability in IT
   1.1 Motivation, History and Concept of Sustainability
   1.2 IT as a Problem and Solution for Sustainability
   1.3 Ethics in IT (Robot Laws According to Asimov)

2. Fundamentals of Ethics
   2.1 Overview: Ethics, Morality and Social Norms
   2.2 Introduction of Ethical Paradigms (Utilitarianism, Virtue and Duty Ethics)
   2.3 Ethics Relevance for IT
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<th>3. Establishment of Sustainable IT</th>
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<tr>
<td>3.1 Basics and Features</td>
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<td>3.2 Impact Cycle</td>
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<tr>
<td>3.3 Measures and Implementation at the Process Level</td>
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<th>4. Social Sustainability</th>
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<td>4.1 Introduction to Human Rights, Data Protection &amp; Privacy</td>
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<tr>
<td>4.2 Basics of the Data Protection Regulation</td>
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<tr>
<td>4.3 Anonymization of Data Using k-Anonymity</td>
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<th>5. Ecological Sustainability</th>
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<tr>
<td>5.1 Introduction to Green Computing (Power Management, Cloud, Energy Savings, Virtualization)</td>
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<tr>
<td>5.2 Ecological Footprint &amp; Trends in Information Technology</td>
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<td>5.3 Risks of Discrimination and Biasses in IT Approaches</td>
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<td>5.4 Circular Economy of Information Technology: Production, Usage and Recycling</td>
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<th>6. Ethical &amp; Sustainable Issues on Case Studies</th>
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<td>6.1 EU Guidelines for Trustworthy AI (Robustness, Transparency, Privacy, Accountability, Fairness, Fundamental Rights &amp; Welfare).</td>
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<td>6.2 Bitcoin Mining and its CO2 Emissions</td>
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<td>6.3 Man or Machine - The Use of Big Data &amp; AI in the Workday</td>
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<td>6.4 Moral Machine Experiment: Moral Decisions of Machines Using the Example of Autonomous Driving</td>
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<td>6.5 Robots between Function and Ethics Using the Example of Nursing Robots in Japan</td>
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**Literature**

**Compulsory Reading**

**Further Reading**

Study Format Distance Learning

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Type of Exam

| Written Assessment: Case Study |

Student Workload

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Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☐ Audio
- ☐ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed
# IT Project Management

**Module Code:** DLBCSEITPAM1

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**Module Coordinator**

N.N. (IT Project Management)

**Contributing Courses to Module**

- IT Project Management (DLBCSEITPAM01)

**Module Exam Type**

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**Weight of Module**

see curriculum

**Module Contents**

- Basic terms and foundations of IT project management
- Large and small planning techniques
- Techniques for prioritization, cost-estimation, and project controlling
- Techniques for stakeholder, communication, and risk management
- Organization and structure in IT project management
- Schools of thought in IT project management
Learning Outcomes

IT Project Management

On successful completion, students will be able to

▪ explain and differentiate between the basic principles and tasks of IT project management.
▪ explain the important practical techniques and methods necessary for the implementation of IT project management.
▪ describe the basic procedural models and explain their advantages and disadvantages as well as their possible applications.
▪ identify possible project risks on the basis of given practical scenarios and select suitable measures from IT project management in order to minimize them in a targeted manner.

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 IU International University of Applied Sciences

All Bachelor Programs in the IT & Technology fields

www.iu.org
Course Description
In this course, typical problems in the management of Software projects are discussed and the methods and techniques used to address challenges conveyed. In addition, standard procedural models for IT project management are explained and their strengths and weaknesses specifically identified.

Course Outcomes
On successful completion, students will be able to

- explain and differentiate between the basic principles and tasks of IT project management.
- explain the important practical techniques and methods necessary for the implementation of IT project management.
- describe the basic procedural models and explain their advantages and disadvantages as well as their possible applications.
- identify possible project risks on the basis of given practical scenarios and select suitable measures from IT project management in order to minimize them in a targeted manner.

Contents
1. Basics Terms and Foundations of IT Project Management
   1.1 Definition of a Project and Types of IT Projects
   1.2 IT Project Lifecycle
   1.3 Multi-Project Management – The Project in the Context of the Organization

2. Planning Techniques
   2.1 Large-Scale Planning: Milestones, Sub-tasks, and Work Packages
   2.2 Large-Scale Planning: Gantt Charts
   2.3 Planning and Organization of Work Packages: Kanban Board

3. Prioritization, Estimation of Costs, Project Controlling
   3.1 Prioritization
   3.2 Estimation of Costs
   3.3 Project Controlling
### 4. Stakeholder, Communication and Risk Management

4.1 Stakeholder Management  
4.2 Communication Management  
4.3 Risk Management  

### 5. Organization and Structure in IT Project Management

5.1 Overview and Levels of Management from PRINCE2  
5.2 Management Processes in PRINCE2  
5.3 Pragmatic IT Project Management (PITPM)  
5.4 Configuration of an IT Project in PITPM  
5.5 Management of a project in PITPM  

### 6. Schools of Thought in IT Project Management

6.1 Agile Software Development  
6.2 Value-Based Software Engineering  

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**Literature**

**Compulsory Reading**

**Further Reading**


www.iu.org
### Study Format Distance Learning

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| Type of Exam | Exam, 90 Minutes |

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### Instructional Methods

- Learning Sprints®
- ✔ Course Book
- ✔ Vodcast
- ✔ Shortcast
- ✔ Audio
- ✔ Exam Template
- □ Review Book
- □ Creative Lab
- □ Guideline
- ✔ Live Tutorium/Course Feed
Techniques and methods for agile software development

Module Code: IWNF1_E

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Module Coordinator
N.N. (Techniques and methods for agile software development)

Contributing Courses to Module
- Techniques and methods for agile software development (IWNF01_E)

Module Exam Type

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Weight of Module
see curriculum

Module Contents
- Characteristics and Principles of Agility
- Agility in Small Teams with SCRUM
- Agile Portfolio and Project Management
- Agile Requirements and IT Architecture Management
- Agile Testing
- Agile Delivery and Deployment

www.iu.org
## Learning Outcomes

**Techniques and methods for agile software development**

On successful completion, students will be able to

- analyse and evaluate problems and risks of industrial SW development and their consequences for development processes.
- know and understand the basic principles of No-Frills Software Engineering.
- analyse practical scenarios and independently apply suitable methods and tools of No-Frills Software Engineering.

### 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 IU International University of Applied Sciences

- All Bachelor Programs in the IT & Technology field
Techniques and methods for agile software development

Course Code: IWNF01_E

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Course Description

The goal of the course is to give students a deeper insight into the topic of agile software development. First of all, the basic characteristics and principles of agility are presented and discussed. Afterwards, it is shown how small projects and teams can use agile software engineering and how agile principles can be transferred and applied to large projects. Afterwards, agile techniques are taught for selected core activities in software engineering, with a focus on testing, delivery and deployment.

Course Outcomes

On successful completion, students will be able to

- analyse and evaluate problems and risks of industrial SW development and their consequences for development processes.
- know and understand the basic principles of No-Frills Software Engineering.
- analyse practical scenarios and independently apply suitable methods and tools of No-Frills Software Engineering.

Contents

1. Characteristics and Principles of Agility
   1.1 Features and Challenges of Software Projects
   1.2 Classification of Uncertainty
   1.3 Comparison of Agile and Classic Software Development
   1.4 Principles of Agility

2. Agility in Small Teams with Scrum
   2.1 Basics and General Structure with SCRUM
   2.2 Central Management Artifact: Product Backlog
   2.3 Other Management Artifacts
3. Agile Portfolio and Project Management
   3.1 Planning Levels in Agile Project Management
   3.2 Agile Portfolio Management
   3.3 Organization of Several Teams in One Project
   3.4 Product and Release Planning

4. Agile Requirements and IT Architecture Management
   4.1 Requirements Engineering in Agile Projects
   4.2 Architecture Management in Agile Projects

5. Agile Testing
   5.1 Basic Principles and Requirements for the QA Organization
   5.2 Test Levels and Agility
   5.3 Test Automation

6. Agile Delivery and Deployment
   6.1 Basics and Continuous Delivery Pipeline
   6.2 Continuous Build and Continuous Integration
   6.3 Acceptance Tests, Load Tests and Continuous Deployment

Literature

Compulsory Reading

Further Reading
## Study Format Distance Learning

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## Instructional Methods

- [ ] Learning Sprints®
- [ ] Course Book
- [ ] Vodcast
- [ ] Shortcast
- [ ] Audio
- [ ] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [ ] Live Tutorium/Course Feed
# Introduction to Mobile Software Engineering

**Module Code:** IWMB1_E

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**Module Coordinator**

N.N. (Mobile Software Engineering)

**Contributing Courses to Module**

- Mobile Software Engineering (IWMB01_E)

**Module Exam Type**

<table>
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**Weight of Module**

- see curriculum

**Module Contents**

- Basics of Mobile Software Development
- Android System Architecture
- Programming Environment
- Core Components of Android Apps
- Interaction between Application Components
- Advanced Methods

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### Learning Outcomes

**Mobile Software Engineering**

On successful completion, students will be able to

- recognize and describe the variances and specific features of software development for mobile systems.
- distinguish between different activities, parts and risks in the creation, operation and maintenance of mobile software systems.
- explain and differentiate the architecture and technical features of the Android Platform.
- autonomously create mobile software systems to solve concrete problems for the Android Platform.

<table>
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Mobile Software Engineering
Course Code: IWMB01_E

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**Course Description**
Using the mobile platform Android as an example, the course explains how the programming of mobile applications (Apps) differs from the development of browser-based information systems, gives an overview of technologies and programming concepts deployed and describes common challenges in the development of apps for industrial applications.

**Course Outcomes**
On successful completion, students will be able to
- recognize and describe the variances and specific features of software development for mobile systems.
- distinguish between different activities, parts and risks in the creation, operation and maintenance of mobile software systems.
- explain and differentiate the architecture and technical features of the Android Platform.
- autonomously create mobile software systems to solve concrete problems for the Android Platform.

**Contents**
1. Basics of Mobile Software Development
   1.1 Special Features of Mobile Devices
   1.2 Special Features of Mobile Software Development
   1.3 Classification of Mobile Devices
   1.4 The Android Platform
2. Android System Architecture
   2.1 The Android System
   2.2 Security Features
   2.3 Communication with Networks
3. Programming Environment
   3.1 Android Studio
   3.2 First App and Emulator Test
   3.3 Application Deployment
4. Core Components of Android Apps
   4.1 Overview of Android App Components
   4.2 Activities, Layouts and Views
   4.3 Resources
   4.4 Summary in an App
   4.5 Graphic Design

5. Interaction between Application Components
   5.1 Intents
   5.2 Services
   5.3 Broadcast Receive

6. Advanced Methods
   6.1 Threading
   6.2 Application memory

Literature

Compulsory Reading

Further Reading
## Study Format Distance Learning

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Seminar: Software Engineering
Module Code: ISSE_E

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Module Coordinator
N.N. (Seminar: Software Engineering)

Contributing Courses to Module
- Seminar: Software Engineering (ISSE01_E)

Module Exam Type

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Weight of Module
see curriculum

Module Contents
The seminar deals with current topics in software engineering. Participants are required to formulate a research question pertaining to a selected topic and present the findings in the form of a written paper.
Learning Outcomes

Seminar: Software Engineering

On successful completion, students will be able to

- independently familiarize themselves with a given topic from the field of “Software Engineering”.
- outline important characteristics, connections and findings in the form of a written assignment.
- present the results obtained in their independent work in the form of a written document.

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 IU International University of Applied Sciences

All Bachelor Programs in the IT & Technology fields
Seminar: Software Engineering
Course Code: ISSE01_E

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Course Description
In this seminar, students write a seminar paper on a specific topic and present their results. In this way, students demonstrate the ability to independently familiarize themselves with a software engineering topic and document and present the knowledge gained in a structured manner.

Course Outcomes
On successful completion, students will be able to
- independently familiarize themselves with a given topic from the field of “Software Engineering”.
- outline important characteristics, connections and findings in the form of a written assignment.
- present the results obtained in their independent work in the form of a written document.

Contents
- The seminar deals with current topics in software engineering. Participants are required to formulate a research question pertaining to a selected topic and present the findings in the form of a written paper.

Literature

Compulsory Reading

Further Reading
Study Format myStudies

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Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
4. Semester
Project: Agile Software Engineering
Module Code: IWNF2_E

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Module Coordinator
N.N. (Project: Agile Software Engineering)

Contributing Courses to Module
- Project: Agile Software Engineering (IWNF02_E)

Module Exam Type

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Weight of Module
see curriculum

Module Contents
Realization and documentation of projects using agile techniques as well as consolidation of selected topics in the field of agile software development.
Learning Outcomes

**Project: Agile Software Engineering**

On successful completion, students will be able to

- address typical problems in various project situations through the targeted use of agile techniques and methods.
- document the design and project-specific use of techniques and tools.

<table>
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Project: Agile Software Engineering

Course Code: IWNF02_E

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**Course Description**

Building on their knowledge of agile software development, students in this course independently implement projects in this subject area and document their results in the form of a written paper.

**Course Outcomes**

On successful completion, students will be able to

- address typical problems in various project situations through the targeted use of agile techniques and methods.
- document the design and project-specific use of techniques and tools.

**Contents**

- Implementation and documentation of a project using agile techniques as well as deepening of knowledge in the field of agile software development.

**Literature**

**Compulsory Reading**

**Further Reading**

- Schwaber, K., & Sutherland, J. (2020). The Scrum guide. The definitive guide to Scrum: The rules of the game. Kenn Schwaber and Jeff Sutherland.
Study Format Distance Learning

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Instructional Methods

- [ ] Learning Sprints®
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- [ ] Vodcast
- [ ] Shortcast
- [ ] Audio
- [ ] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [x] Guideline
- [ ] Live Tutorium/Course Feed
Module Type: see curriculum
Admission Requirements: none
Study Level: BA
CP: 5
Student Workload: 150 h

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

Module Coordinator:
Prof. Dr. Marian Benner-Wickner (IT Infrastructure)

Contributing Courses to Module:
- IT Infrastructure (DLBSEPITI01_E)

Module Exam Type:
Module Exam
Study Format: Distance Learning
Exam, 90 Minutes
Split Exam

Weight of Module: see curriculum

Module Contents:
- Fundamentals of Operating Systems
- Processes
- Data-Storage
- Virtualization
- Networks
- Remote Access
- Infrastructure Provisioning
## Learning Outcomes

### IT Infrastructure

On successful completion, students will be able to

- understand main aspects of the operation of computers.
- manipulate and manage computer operations using shells and more visual user-interfaces.
- understand, analyze and configure simple IP network structures.
- manipulate and manage basic orchestrated sets of containers.

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IT Infrastructure

Course Code: DLBSEPITI01_E

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Course Description

This course describes the internal basic structure of computers and how they operate: Starting from the basic models of operating systems, the essential manipulation methods (shells and other user-interfaces) are structured and experimented. Networking basics are introduced far enough that they can be practiced. Contemporary network and virtualization structures and practices are explained so that students can experiment them on their own.

Course Outcomes

On successful completion, students will be able to

▪ understand main aspects of the operation of computers.
▪ manipulate and manage computer operations using shells and more visual user-interfaces.
▪ understand, analyze and configure simple IP network structures.
▪ manipulate and manage basic orchestrated sets of containers.

Contents

1. Fundamentals of Operating Systems
   1.1 The User, the Inventor, the Maker, the Developer and the Support
   1.2 Standard Ingredients
   1.3 Kernel, APIs, Application Programs
   1.4 WIMP
   1.5 REPL Shell

2. Processes
   2.1 Process-Scheduling, Traps and Threads
   2.2 Process-Management
   2.3 Process Security

3. Data-Storage
   3.1 Hard-Disk, Blocks, Formatting
   3.2 Files and their Manipulation
   3.3 Permissions of Files
   3.4 Data Pipes
   3.5 Network Data Storage
4. Virtualization
   4.1 Concepts of Virtual Machines and Containers
   4.2 Virtual Machines
   4.3 Containers
   4.4 Sharing Resources

5. Networks
   5.1 Transmission Media, Commutation, Packet Switching
   5.2 TCP/IP and Related Communication Standards
   5.3 Web-Servers
   5.4 Public Key Cryptography
   5.5 Network Security

6. Remote Access
   6.1 Remote Shell
   6.2 Remote UI
   6.3 Web-Services
   6.4 Challenges of Distributed Computing

7. Infrastructure Provisioning
   7.1 Specification and Planning of Containers
   7.2 Orchestration of Containers
   7.3 Horizontal and Vertical Scaling
   7.4 Load-Testing and Monitoring

**Literature**

**Compulsory Reading**

**Further Reading**
### Study Format Distance Learning

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### Instructional Methods

- ☑ Learning Sprints®
- ☑ Course Book
- ☑ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☑ Review Book
- ☑ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed
## IT Service Management

**Module Code:** DLBCSITSM-01

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**Module Coordinator**

N.N. (IT Service Management)

**Contributing Courses to Module**

- IT Service Management (DLBCSITSM01-01)

**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**

- IT Service Management Basics and Terms
- ITIL 4 - Basics and Four Dimensions
- ITIL 4 - Service Value System
- ITIL 4 - Principles
- ITIL 4 - Practices
- Information Security Management with the IT Baseline Protection Framework of the BSI
Learning Outcomes

IT Service Management

On successful completion, students will be able to

▪ identify the fundamentals and challenges of IT service management.
▪ describe the motivation and structure of the IT Infrastructure Library (ITIL), distinguish four dimensions, apply the service value system and identify concrete practices.
▪ describe and apply fundamentals of IT security management.

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 IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field.
IT Service Management
Course Code: DLBCSITSM01-01

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Course Description
IT service management is an approach to align and understand a company's IT as a service provider and supporter of operational and business processes. This course uses the IT Infrastructure Library (ITIL) to teach concepts, procedures and best practices in the area of IT service management (IT operations). In other words, it looks at the management of activities that take place after an IT system has been developed: IT operations as a continuous run of the productive day-to-day business of a company's IT departments.

Course Outcomes
On successful completion, students will be able to
- identify the fundamentals and challenges of IT service management.
- describe the motivation and structure of the IT Infrastructure Library (ITIL), distinguish four dimensions, apply the service value system and identify concrete practices.
- describe and apply fundamentals of IT security management.

Contents
1. IT Service Management Basics and Terms
   1.1 IT Services
   1.2 IT Service Management
   1.3 ITSM Frameworks
2. ITIL 4 - Basics and Four Dimensions
   2.1 Stakeholders, Services and Service Management
   2.2 Value Contribution of IT
3. ITIL 4 - Service Value System
   3.1 Basics and Overview
   3.2 Inputs, Outcome and Governance
   3.3 The Service Value Chain
   3.4 Continual Improvement
4. ITIL 4 - Principles
   4.1 Overview
   4.2 Value Orientation
   4.3 Iterative Procedure and Feedback
   4.4 Establish Collaboration and Visibility
   4.5 Optimize and Automate

5. ITIL 4 - Practices
   5.1 Overview
   5.2 General Management Practices
   5.3 Service Management Practices
   5.4 Technical Practices

6. Information Security Management with the IT Basic Protection Framework of the BSI
   6.1 Structure and Elements of BSI Basic Protection Framework
   6.2 Information Security Process

Literature

Compulsory Reading

Further Reading

### Study Format myStudies

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Study Format Distance Learning

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Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcut
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
Module Code: IWMB2-01_E

Module Type: see curriculum

Admission Requirements:
one

Study Level:
BA

CP:
5

Student Workload:
150 h

Semester / Term:
see curriculum

Duration:
Minimum 1 semester

Regularly offered in:
WiSe/SoSe

Language of Instruction:
English

Module Coordinator:
N.N. (Project: Mobile Software Engineering)

Contributing Courses to Module:
- Project: Mobile Software Engineering (IWMB02-01_E)

Module Exam Type:

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Weight of Module:
see curriculum

Module Contents:
Design, implementation and documentation of small, mobile applications based on a specific example.
## Learning Outcomes

**Project: Mobile Software Engineering**

On successful completion, students will be able to

- autonomously design and prototype small mobile applications to solve a specific task.
- identify typical problems and challenges in the practical implementation of small mobile applications.
- document the creation and implementation of small, autonomously designed and implemented mobile applications.

## 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 IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field
Project: Mobile Software Engineering

Course Description
With the material conveyed in the course "Mobile Software Engineering Using the Android Platform as an Example", students autonomously create a mobile application and document its design and implementation.

Course Outcomes
On successful completion, students will be able to

▪ autonomously design and prototype small mobile applications to solve a specific task.
▪ identify typical problems and challenges in the practical implementation of small mobile applications.
▪ document the creation and implementation of small, autonomously designed and implemented mobile applications.

Contents
▪ Design, implementation and documentation of small, mobile applications based on a specific example. Possible topics are, for example:
  ▪ A radio app to improve the exchange between listeners and station in general, and particularly between listeners and radio presenters.
  ▪ An app that allows a group of board game fans to better organize their regular evening game schedule.
  ▪ An app that enables the supervisors of assignments at IUBH to improve their support procedures.
### Literature

#### Compulsory Reading


## Study Format Distance Learning

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## Instructional Methods

- Learning Sprints®
- Course Book
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- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Module Type
see curriculum

Admission Requirements
None

Study Level
BA

CP
5

Student Workload
150 h

Semester / Term
see curriculum

Duration
Minimum 1 semester

Regularly offered in
WiSe/SoSe

Language of Instruction
English

Module Coordinator
Prof. Dr. Marian Benner-Wickner (Cloud Programming)

Contributing Courses to Module
- Cloud Programming (DLBSEPCP01_E)

Module Exam Type

Module Exam
Study Format: Distance Learning
Portfolio

Split Exam

Weight of Module
see curriculum

Module Contents
The students employ and polish their knowledge of distributed computer systems so as to be able to plan, create, test, and document a scalable service deployed in the cloud. The module is focused on a practical realization and its documentation: Through the testable deployment, students guarantee that their project can be realized and has requirements of a cloud system, through the documentation, the student demonstrates the qualities of the realization and of its creation process.
Learning Outcomes

Cloud Programming
On successful completion, students will be able to

▪ associate characteristics of a cloud infrastructure as discussed in business with concrete implications for the machines deployed in the cloud.
▪ create a plan for a chosen cloud infrastructure provider and measure the achievement of this plan.
▪ specify by means of scripts, programs, documented web-platform usage, how the elements of a cloud service are created and measured.
▪ describe the risks, the protection measures, and the reaction measures of a cloud-service.
▪ demonstrate a running cloud-service created by the student and allow it to be tested in all its possible usage dimensions.

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 IU International University of Applied Sciences
All Bachelor Programs in the IT & Technology fields
Cloud Programming

Course Code: DLBSEPCP01_E

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Course Description

The usage of commodity computing in the form of a service offered over a network interface is a major technical aspect of services made by IT organizations. The services function within a server environment and the ubiquity of the network make the service reachable from everywhere with high availability guarantees and flexible scalability. The course aims at a documented realization of a cloud service which displays all the attributes of a cloud service. In doing so the students employ and deepen their knowledge of distributed computer systems so as to be able to plan, create, deploy, test, measure, and document a scalable service in the cloud.

Course Outcomes

On successful completion, students will be able to

- associate characteristics of a cloud infrastructure as discussed in business with concrete implications for the machines deployed in the cloud.
- create a plan for a chosen cloud infrastructure provider and measure the achievement of this plan.
- specify by means of scripts, programs, documented web-platform usage, how the elements of a cloud service are created and measured.
- describe the risks, the protection measures, and the reaction measures of a cloud-service.
- demonstrate a running cloud-service created by the student and allow it to be tested in all its possible usage dimensions.

Contents

- In this course, students create a cloud service which demonstrates the core aspects of cloud service programming by an explicit documentation and by a measurable concrete realization. To do so, they choose a PaaS cloud service hoster, set-up a service, describe its interfaces (API) and how the core characteristics of cloud services are achieved:
  - Horizontal or vertical scalability: How the service can be enlarged or diminished in its usage of resources in order to react to variation to the demand.
  - High-availability: What guarantees a failover in case a component of the service is made inoperable and what kind of degradation can happen.
  - Measurability: How the usage of resources is measured and how these measures can allow a proactive planning.
  - Orchestration and provisioning: How the service is deployed and changes in its resources allocations are performed as needed by the usage of the service.
The cloud service should be testable and demonstratable by external users; a plan how to test it should be part of the documentation including the dimensions of the usage as well as the API definitions of the service. The service should fulfill a recognizable business need and be documented by an API definition and a user-interface for its usage runnable on any platform that has access to the internet. Being a service on the internet, its security restrictions should be accessible and understandable. Based on these ingredients, the students realize a work in the form of software artifacts in a versioning system and a human readable documentation of the realization and its process. The realization and its documentation should follow current trends in cloud engineering.

**Literature**

**Compulsory Reading**

**Further Reading**

### Study Format Distance Learning

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### Instructional Methods

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- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Introduction to Data Protection and Cyber Security
Module Code: DLBCSIDPITS

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Module Coordinator
Prof. Dr. Ralf Kneuper (Introduction to Data Protection and Cyber Security)

Contributing Courses to Module
- Introduction to Data Protection and Cyber Security (DLBCSIDPITS01)

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
- Fundamentals of IT Security
- Data Protection
- IT Security Management
- Network and Communication Security
Learning Outcomes

Introduction to Data Protection and Cyber Security

On successful completion, students will be able to

- explain the terms and concepts of IT security and know the typical procedures and techniques which exist in each area.
- cite the legal regulations on data protection and explain their implementation.
- discuss in-depth IT security management and suitable measures for implementation.
- use their overview knowledge of activities and strategies for IT security in software and system development.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field(s).
Introduction to Data Protection and Cyber Security

Course Code: DLBCSIDPITS01

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Course Description
In this course, the students are familiarized with important concepts from the field of IT security. Basic terms are introduced and discussed, and typical application fields, areas of IT security application, and typical procedures and techniques are introduced and described.

Course Outcomes
On successful completion, students will be able to
- explain the terms and concepts of IT security and know the typical procedures and techniques which exist in each area.
- cite the legal regulations on data protection and explain their implementation.
- discuss in-depth IT security management and suitable measures for implementation.
- use their overview knowledge of activities and strategies for IT security in software and system development.

Contents
1. Fundamentals of Data Protection and Cyber Security
   1.1 Conceptual Bases, Protection Goals
   1.2 Attacks and Threats
   1.3 Security Strategy
   1.4 Legal Regulations

2. Data Protection
   2.1 Data Protection as a Personal Right
   2.2 Basic Principles of Data Protection
   2.3 EU General Data Protection Regulation
   2.4 Further International Regulations on Data Protection
   2.5 Cross-Border Data Flow
   2.6 Data Protection in Everyday Life
3. Basic Functions of Cyber Security and Their Implementation
   3.1 Identification and Authentication
   3.2 Rights Management
   3.3 Rights Check
   3.4 Preservation of Evidence

4. Cyber Security Management
   4.1 Basic Concepts and Standards in Cyber Security Management
   4.2 Series of Standards ISO 2700x

5. Cyber Security Management in Everyday Life
   5.1 Password Management
   5.2 Data Backup
   5.3 Email Security
   5.4 Protection Against Viruses and Other Malware
   5.5 Protection Against Social Engineering Attacks

6. Network and Communication Security
   6.1 Firewall Technology
   6.2 Network Separation
   6.3 Security in WLAN, Mobile Networks, Bluetooth, and NFC

7. Cyber Security in the Development of Software and Systems
   7.1 Protection of the Development Environment
   7.2 Secure Development
   7.3 Common Criteria

Literature

Compulsory Reading

Further Reading

Study Format myStudies

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Instructional Methods

- [ ] Learning Sprints®
- [ ] Course Book
- [ ] Vodcast
- [ ] Shortcast
- [ ] Audio
- [ ] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [ ] Live Tutorium/Course Feed
### Study Format Distance Learning

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| Type of Exam | Exam, 90 Minutes |

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
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- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
5. Semester
# DevOps and Continuous Delivery

**Module Code:** DLBSEPDOCD_E

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**Module Coordinator**

Prof. Dr. Marian Benner-Wickner (DevOps and Continuous Delivery)

**Contributing Courses to Module**

- DevOps and Continuous Delivery (DLBSEPDOCD01_E)

**Module Exam Type**

- **Module Exam**
  - Study Format: Distance Learning
  - Written Assessment: Case Study
  - **Split Exam**

**Weight of Module**

see curriculum

**Module Contents**

- The DevOps Approach
- Service Architectures
- DevOps Environment
- Continuous Integration and Deployment
- Automated Testing
- Information Security in DevOps
### Learning Outcomes

**DevOps and Continuous Delivery**

On successful completion, students will be able to

- discuss key aspects of DevOps culture,
- apply hands-on experience with techniques related to DevOps and continuous deployment,
- create, configure and deploy platform as a service container,
- manage (micro-)service architectures using platform as a service technique,
- construct and maintain a continuous deployment pipeline to develop and deploy an application iteratively and incrementally.

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DevOps and Continuous Delivery
Course Code: DLBSEPDOCD01_E

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Course Description
When developing modern applications from scratch, emerging approaches like microservice architectures, agile techniques and virtualization are becoming important. Agile development stands for very quick releases of small software increments. Since important recurring tasks for each release like testing, configuration and deployment are time-consuming, a highly automated software development and deployment process is required. As well, development and deployment more and more becomes one single task, triggered by a single code commit. Implementing a fully automated continuous delivery pipeline and putting development and operations into one DevOps team holistically responsible for one microservice are essential for modern software development. In this course, both approaches are introduced with a strong focus on tool practice.

Course Outcomes
On successful completion, students will be able to
- discuss key aspects of DevOps culture,
- apply hands-on experience with techniques related to DevOps and continuous deployment,
- create, configure and deploy platform as a service container,
- manage (micro-)service architectures using platform as a service technique,
- construct and maintain a continuous deployment pipeline to develop and deploy an application iteratively and incrementally.

Contents
1. The DevOps Approach
   1.1 Issues in Classic Approaches
   1.2 Goals of DevOps
   1.3 DevOps Case Studies
   1.4 DevSecOps

2. Service Architectures
   2.1 Microservice
   2.2 Domain-Driven Design
   2.3 Containerization and Platform as a Service
   2.4 Practical Examples
3. DevOps Environment
   3.1 Version Control Concepts
   3.2 Version Control Tools
   3.3 Code Repositories
   3.4 Package Manager
   3.5 Virtualization

4. Continuous Integration and Deployment
   4.1 Continuous Delivery Pipeline
   4.2 Build Tools
   4.3 CI/CD Engines and Server
   4.4 Configuration Management and Infrastructure as Code

5. Automated Testing
   5.1 Basic Concepts
   5.2 Static Analysis Tools
   5.3 Unit Testing Tools
   5.4 UI and Acceptance Tests Tools
   5.5 Performance Testing Tools

6. Information Security in DevOps
   6.1 Roles and Responsibilities
   6.2 Change Management
### Literature

#### Compulsory Reading

#### Further Reading

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Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
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- Creative Lab
- Guideline
- Live Tutorium/Course Feed

www.iu.org
## User Interface Design and Ergonomics

**Module Code:** DLBMIUID1_E

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**Module Coordinator**

N.N. (User Interface Design and Ergonomics)

**Contributing Courses to Module**

- User Interface Design and Ergonomics (DLBMIUID01_E)

**Module Exam Type**

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**Weight of Module**

see curriculum

**Module Contents**

- Introduction, Terms, Basics
- Human-Centered Design Process
- Information Architecture
- User Interface Design Elements
- Responsive User Interfaces
- Usability
### Learning Outcomes

**User Interface Design and Ergonomics**

On successful completion, students will be able to

- name and describe central concepts for the design of user interfaces and apply the basic principles of the design process.
- describe the benefits and use of information architectures for the design of user interface and create macro- and micro-information architectures.
- name and describe the design elements of user interfaces.
- name, describe and delimit the central concepts for responsive user interfaces.
- explain the terms usability and accessibility, represent their relation to the design of user interfaces and apply important concepts from those terms in the design of user interfaces.

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User Interface Design and Ergonomics
Course Code: DLBMIUID01_E

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### Course Description
In this course, fundamentals and important concepts for the design of user interfaces are presented and discussed. Here, a focus is placed on web and mobile UIs. After a brief introduction to the topic of UI design and ergonomics, the general flow of UI design processes will be presented and discussed. Then the concept of information architecture will be introduced, which is an essential model for structuring the content of UIs. Thereafter typical design elements in UIs will be presented and described. This is followed by the topic of designing responsive user interfaces. The topics of usability and accessibility conclude this course.

### Course Outcomes
On successful completion, students will be able to

- name and describe central concepts for the design of user interfaces and apply the basic principles of the design process.
- describe the benefits and use of information architectures for the design of user interface and create macro- and micro-information architectures.
- name and describe the design elements of user interfaces.
- name, describe and delimit the central concepts for responsive user interfaces.
- explain the terms usability and accessibility, represent their relation to the design of user interfaces and apply important concepts from those terms in the design of user interfaces.

### Contents
1. Introduction, Terms, Basics
   1.1 Clarification of Terms: User Interface, Ergonomics, Usability
   1.2 Types of User Interfaces
   1.3 Challenges in the Design of User Interfaces
   1.4 Standards and Guidelines
2. Human-Centered Design Process
   2.1 Human-Centered Design Process
   2.2 Cooperative, Iterative Approach
   2.3 Requirements and Target Groups
   2.4 Prototyping and Evaluations
   2.5 Double-Diamond-Design-Model

3. Information Architecture
   3.1 Types of Websites
   3.2 Macro Information Architecture
   3.3 Micro Information Architecture

4. Design Elements of User Interfaces
   4.1 Navigation Elements
   4.2 Search Function
   4.3 Page Design
   4.4 Accessibility

5. Responsive User Interfaces
   5.1 Basics, Principles, Challenges
   5.2 Layout Types, Grid Systems, Breakpoints
   5.3 Media Queries
   5.4 Layout Patterns

Literature

Compulsory Reading

Further Reading

Study Format Distance Learning

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Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
**Introduction to Programming with Python**

*Module Code: DLBDSIPWP*

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**Module Coordinator**

Dr. Reza Shahbazfar (Introduction to Programming with Python)

**Contributing Courses to Module**

- Introduction to Programming with Python (DLBDSIPWP01)

**Module Exam Type**

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Exam, 90 Minutes |  |

**Weight of Module**

see curriculum

**Module Contents**

- Python as a programming language for data science
- Variables and built-in datatypes
- Statements and functions
- Error and exception handling
- Important Python data science modules
Learning Outcomes

Introduction to Programming with Python

On successful completion, students will be able to

- use fundamental Python syntax.
- recollect common elementary data types.
- recognize foundational programming concepts and their realization in Python.
- understand error handling and logging.
- create working programs.
- list the most important libraries and packages for data science.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field(s).
Introduction to Programming with Python

Course Code: DLBDSIPWP01

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Course Description
This course provides students with a foundational understanding of the Python programming language. Following an introductory exposition to the importance of Python for data science-related programming tasks, students will be acquainted with fundamental programming concepts like variables, data types, and statements. Building on this basis, the important notion of a function is explained and errors, exception handling, and logging are explicated. The course concludes with an overview of the most widely-used library packages for data science.

Course Outcomes
On successful completion, students will be able to

- use fundamental Python syntax.
- recollect common elementary data types.
- recognize foundational programming concepts and their realization in Python.
- understand error handling and logging.
- create working programs.
- list the most important libraries and packages for data science.

Contents
1. Introduction
   1.1 Why Python?
   1.2 Obtaining and installing Python
   1.3 The Python interpreter, IPython, and Jupyter

2. Variables and Data Types
   2.1 Variables and value assignment
   2.2 Numbers
   2.3 Strings
   2.4 Collections
   2.5 Files
3. Statements
   3.1 Assignment, expressions, and print
   3.2 Conditional statements
   3.3 Loops
   3.4 Iterators and comprehensions

4. Functions
   4.1 Function declaration
   4.2 Scope
   4.3 Arguments

5. Errors and Exceptions
   5.1 Errors
   5.2 Exception handling
   5.3 Logs

6. Modules and Packages
   6.1 Usage
   6.2 Namespaces
   6.3 Documentation
   6.4 Popular data science packages

Literature

Compulsory Reading

Further Reading

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Instructional Methods

- [ ] Learning Sprints®
- [x] Course Book
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## Instructional Methods

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# Project: Software Development

**Module Code:** DLBSEPPSD_E

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**Module Coordinator**

Prof. Dr. Marian Benner-Wickner (Project: Software Development)

**Contributing Courses to Module**

- Project: Software Development (DLBSEPPSD01_E)

**Module Exam Type**

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**Weight of Module**

see curriculum

**Module Contents**

The Software Development Project offers students the opportunity to gain practical experience in the field of software development based on the subject-specific study components. For this purpose, any kind of software is to be implemented, for example a comprehensive mobile or web app, or a set of cloud-hosted microservices that together fulfill a complex business need. However, the software should be able to solve a relevant problem from practice, either way.
Learning Outcomes

Project: Software Development

On successful completion, students will be able to

▪ identify relevant problems from the professional environment of software developer and explain them to an interested audience,
▪ apply established procedures to find a software-based solution to the problem,
▪ find relevant technologies, programming languages and software libraries for the solution and deploy them on any suitable infrastructure,
▪ evaluate the result in terms of its suitability for solving the practical problem,
▪ present the problem, the solution and the way to get there in a comprehensible and descriptive way.

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 IU International University of Applied Sciences

All Bachelor Programs in the IT & Technology field
Project: Software Development
Course Code: DLBSEPPSD01_E

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Course Description
In the course of the studies, a variety of different concepts, methods and techniques were introduced that are relevant to the professional practice of a software developer. This project offers the opportunity to use the accumulated knowledge and skills to solve a relevant practical problem independently and on one’s own responsibility. The result should be a software that has been fully implemented, tested and that is deployable. The software shall profoundly demonstrate how the practical problem can be solved. The result has to be made available as open source to other students and to the tutor on a platform provided for this purpose.

Course Outcomes
On successful completion, students will be able to
- identify relevant problems from the professional environment of software developer and explain them to an interested audience,
- apply established procedures to find a software-based solution to the problem,
- find relevant technologies, programming languages and software libraries for the solution and deploy them on any suitable infrastructure,
- evaluate the result in terms of its suitability for solving the practical problem,
- present the problem, the solution and the way to get there in a comprehensible and descriptive way.

Contents
- At the beginning of the project the students choose a concrete task in coordination with the tutor. The task shall be derived from a relevant practical problem. Possible problems and use cases can be found in any industry from insurance to healthcare. Problems are also found in cross-sectional topics like, for example, in the areas of smart services, smart home, business information systems, artificial intelligence, sustainability, accessibility, data analytics or robotic process automation. The solution approach can consider mobile apps, web apps, web services, microservices, embedded software or even batch jobs hosted on mainframes. Students work on the task with the help of an integrated development environment that fits the subject of the task. The environment is intended to focus on software (e.g. technology-specific development environments such as Eclipse IDE, Android Studio or matlab) but can also be extended to hardware environment (e.g. prototyping boards such as the Arduino). To complete the task, students apply the concepts, methods and tools taught throughout the curriculum. The result is evaluated in terms of its suitability to solve the previously selected problem. Aspects such as complexity, creativity and practical relevance play a role.
### Literature

#### Compulsory Reading

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### Study Format Distance Learning

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### Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
- ☐ Vodcast
- ☐ Shortcast
- ☐ Audio
- ☐ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☐ Live Tutorium/Course Feed
### Mathematics Basics

**Module Code:** DLBSEWMG_E

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**Module Coordinator**

N.N. (Mathematics I) / Prof. Dr. Leonardo Riccardi (Mathematics II)

**Contributing Courses to Module**

- Mathematics I (DLBCSM101)
- Mathematics II (DLBCSM201)

**Module Exam Type**

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|                 | Mathematics II |
|                 | • Study Format "myStudies": Exam, 90 Minutes |
|                 | • Study Format “Distance Learning”: Exam, 90 Minutes |

**Weight of Module**

see curriculum
### Module Contents

**Mathematics I**
- Basic Definitions and Terms of Discrete Mathematics
- Sets and Propositional Logic
- Number Systems such as Decimal and Binary Systems
- Graphs and Mappings
- Selected Topics of Elementary Number Theory
- Cryptography

**Mathematics II**
- Selected Topics of Linear Algebra
- Selected Chapters on Graphs and Algorithms

### Learning Outcomes

**Mathematics I**
On successful completion, students will be able to
- understand basic terms of discrete mathematics as well as describe them and distinguish them from each other.
- understand concepts of number theory and their application in IT and technology and be able to solve tasks independently by applying these concepts.

**Mathematics II**
On successful completion, students will be able to
- understand basic concepts of linear algebra, their interrelations, and their application in IT and technology and be able solve tasks independently using these concepts.
- understand and distinguish the basic concepts and important algorithms for graphs and trees from the field of discrete mathematics as well as their application in IT and technology.

### 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 IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management field.
Mathematics I
Course Code: DLBCSM101

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**Course Description**

Many practical concepts in IT and technology are based on the findings of discrete mathematics. For an in-depth understanding of, for example, data structures, the construction of communication networks, or of solutions to algorithmic problems, a basic understanding of their mathematical background is necessary. This course therefore introduces discrete mathematical terms and concepts, with specific areas of number theory also taught.

**Course Outcomes**

On successful completion, students will be able to

- understand basic terms of discrete mathematics as well as describe them and distinguish them from each other.
- understand concepts of number theory and their application in IT and technology and be able to solve tasks independently by applying these concepts.

**Contents**

1. Mathematical Basics
   1.1 Basic Concepts
   1.2 Proof Techniques
   1.3 Finite Sums

2. Sets
   2.1 Properties and Calculation Rules for Sets
   2.2 Equivalence Relations

3. Propositional Logic
   3.1 Statements and Logical Connections
   3.2 Truth Tables
   3.3 Computational Rules of Propositional Logic
   3.4 Simplification of Expressions in Propositional Logic
### 4. Number Systems
- 4.1 Decimal System
- 4.2 Binary System
- 4.3 Hexadecimal System

### 5. Mappings
- 5.1 Mappings and Graphs
- 5.2 Special Properties of Mappings

### 6. Basic Algebraic Structures
- 6.1 Groups
- 6.2 Rings
- 6.3 Residual Class Rings

### 7. Prime Numbers
- 7.1 Definition and Properties of Prime Numbers
- 7.2 Prime Number Test

### 8. Modular Arithmetic
- 8.1 The Euclidean Algorithm
- 8.2 Fundamental Theorem of Arithmetic

### 9. Applications in Cryptography
- 9.1 The Shift Cryptosystem
- 9.2 Symmetric vs Asymmetric Cryptosystems
- 9.3 The RSA Cryptosystem

---

**Literature**

**Compulsory Reading**

**Further Reading**
### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Study Format myStudies

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Type of Exam

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Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Mathematics II
Course Code: DLBCSM201

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**Course Description**
This course continues the introduction to topics of discrete mathematics which began in the module "Mathematics Fundamentals I". In this course, the concepts of linear algebra are introduced and knowledge about graphs and algorithms for graphs is deepened. Typical questions of applied computer science are selected, and students are shown how they can be solved with graphs.

**Course Outcomes**
On successful completion, students will be able to

- understand basic concepts of linear algebra, their interrelations, and their application in IT and technology and be able solve tasks independently using these concepts.
- understand and distinguish the basic concepts and important algorithms for graphs and trees from the field of discrete mathematics as well as their application in IT and technology.

**Contents**
1. Introduction to Matrices
   1.1 Basic Concepts of Matrices
   1.2 Addition of Matrices
   1.3 Scalar Multiplication and Product
2. Inverting Matrices
   2.1 Multiplication of Matrices
   2.2 Properties of Matrix Multiplication
   2.3 Inverse Matrices
3. Linear Systems of Equations
   3.1 Gauss Algorithm
   3.2 Example Applications of the Gaussian Algorithm
4. Introduction to Graphs
   4.1 Undirected Graphs
   4.2 Further Properties of Graphs
   4.3 Adjacency Matrix
5. The Problem of the Shortest Routes
   5.1 Directional Graph or Digraph
   5.2 Weighted Graph
   5.3 Dijkstra’s Algorithm

6. The Königsberg Bridge Problem
   6.1 Routing in Graphs
   6.2 Eulerian Graph
   6.3 Hierholzer’s Algorithm
   6.4 The Postman Problem

7. A City Tour Where Each City is Visited Exactly Once.
   7.1 Special Graphs
   7.2 Hamiltonian Graph
   7.3 The Ore and Dirac Condition
   7.4 The Problem of the Traveling Salesman

8. Trees
   8.1 Properties of Trees
   8.2 Root Tree
   8.3 Spanning Tree
   8.4 Minimal Spanning Tree

Literature

Compulsory Reading

Further Reading

### Study Format myStudies

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| Type of Exam | Exam, 90 Minutes |

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
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- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
**Study Format Distance Learning**

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**Instructional Methods**

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
## Mathematics: Linear Algebra and Analysis

**Module Code:** DLBSEWMLAA_E

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### Module Coordinator
Prof. Dr. Moustafa Nawito (Mathematics: Linear Algebra) / Prof. Dr. Robert Graf (Mathematics: Analysis)

### Contributing Courses to Module
- Mathematics: Linear Algebra (DLBDSMFLA01)
- Mathematics: Analysis (DLBDSMFC01)

### Module Exam Type

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### Weight of Module
see curriculum
### Module Contents

**Mathematics: Linear Algebra**
- Matrix Algebra
- Vector Spaces
- Linear and Affine Transformations
- Analytical Geometry
- Matrix Decomposition

**Mathematics: Analysis**
- Sequences and Series
- Functions and Reverse Functions
- Differential Calculus
- Integral Calculus

### Learning Outcomes

**Mathematics: Linear Algebra**
On successful completion, students will be able to
- explain fundamental notions in the domain of linear equation systems.
- exemplify properties of vectors and vector spaces.
- summarize characteristics of linear and affine mappings.
- identify important relations in analytical geometry.
- utilize different methods for matrix decomposition.

**Mathematics: Analysis**
On successful completion, students will be able to
- summarize the basic concepts of analysis.
- illustrate the terms “consequences” and “series”.
- explain the concept of function and to understand the concept of the inverse function.
- explain basic statements of the differential and integral calculus.
- explain the relationship between differentiation and integration.
- master the derivation of higher-dimensional functions.

### 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 IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management field.
Mathematics: Linear Algebra

Course Code: DLBDSMFLA01

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Course Description
Linear algebra is a fundamental subject in mathematics. Its historical origin lies in the development of solution techniques for systems of linear equations arising from geometric problems. Numerous scientific and engineering applications can be solved using its methods. This course introduces the foundations of linear algebra and its basic notions like vectors and matrices. It then builds upon this foundation by introducing the derivation of solution techniques for problems in analytical geometry.

Course Outcomes
On successful completion, students will be able to
- explain fundamental notions in the domain of linear equation systems.
- exemplify properties of vectors and vector spaces.
- summarize characteristics of linear and affine mappings.
- identify important relations in analytical geometry.
- utilize different methods for matrix decomposition.

Contents
1. Fundamentals
   1.1 Systems of linear equations
   1.2 Matrices as compact representations of linear equations
   1.3 Matrix algebra
   1.4 Inverse and trace

2. Vector Spaces
   2.1 Definition
   2.2 Linear combination and linear dependance
   2.3 Base, span, and rank

3. Linear and affine mappings
   3.1 Matrix representations of linear mappings
   3.2 Image and kernel
   3.3 Affine spaces and sub-spaces
   3.4 Affine mappings
4. Analytical Geometry
   4.1 Norms
   4.2 Inner and dot product
   4.3 Orthogonal projections
   4.4 Rotations

5. Matrix Decomposition
   5.1 Determinant and trace
   5.2 Eigenvalues and eigenvectors
   5.3 Cholesky decomposition
   5.4 Eigenvalue decomposition and diagonalisation
   5.5 Singular value decomposition

Literature

Compulsory Reading

Further Reading
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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☑ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
Mathematics: Analysis

Course Code: DLBDSMFC01

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**Course Description**

Analysis is one of the essential basic subjects of mathematics. Originally developed to be able to formulate and solve problems of classical mechanics mathematically, in its present rigorous form it has become indispensable in numerous applications in the natural sciences and technology. This module aims to introduce the basic hand tool of differential and integral calculus and to explain their mutual interrelations. In addition, the differential calculus is generalized to multidimensional spaces.

**Course Outcomes**

On successful completion, students will be able to

- summarize the basic concepts of analysis.
- illustrate the terms “consequences” and “series”.
- explain the concept of function and to understand the concept of the inverse function.
- explain basic statements of the differential and integral calculus.
- explain the relationship between differentiation and integration.
- master the derivation of higher-dimensional functions.

**Contents**

1. Sequences and series
   1.1 Sequences and series
   1.2 Convergence of infinite series
   1.3 power series

2. Functions and reverse functions
   2.1 Continuous functions
   2.2 Exponential and logarithm function
   2.3 Trigonometric functions and their inverse functions

3. Differential calculus
   3.1 Derivatives and higher derivatives
   3.2 curve discussion
   3.3 Rules (chain rule, product rule, quotient rule …)
   3.4 Taylor Rows

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4. Integral calculus
   4.1 The Riemann Integral
   4.2 Specific and indefinite integrals
   4.3 The fundamental theorem of differential and integral calculus
   4.4 Volumes and shells of rotary bodies
   4.5 Paths and lengths

5. Differential calculus in the Rn
   5.1 Partial Derivation
   5.2 Total Derivation
   5.3 Gradients of vector-valued functions and matrices

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**Literature**

**Compulsory Reading**

**Further Reading**

## Study Format Distance Learning

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## Student Workload

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## Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☑ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
## Statistics Basics

**Module Code:** DLBSEWSG_E

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- DLBDSSPDS01 | BA | 10 | 300 h |

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**Module Coordinator**

Prof. Dr. Stefan Stöckl (Statistics: Probability and Descriptive Statistics ) / Dr. Stefan Stöckl (Statistics - Inferential Statistics)

**Contributing Courses to Module**

- Statistics: Probability and Descriptive Statistics (DLBDSSPDS01)
- Statistics - Inferential Statistics (DLBDSSIS01)

**Module Exam Type**

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| Statistics: Probability and Descriptive Statistics  
- Study Format "Distance Learning": Exam, 90 Minutes (-)  
- Study Format "myStudies": Exam, 90 Minutes | Statistics - Inferential Statistics  
- Study Format "Distance Learning": Exam, 90 Minutes |

**Weight of Module**

see curriculum
Module Contents

**Statistics: Probability and Descriptive Statistics**
- Probability
- Random Variables
- Joint Distributions
- Expectation and Variance
- Inequalities and Limit Theorems

**Statistics - Inferential Statistics**
- Point Estimation
- Uncertainties
- Bayesian Inference & Non-Parametric Techniques
- Statistical Testing
- Statistical Decision Theory

Learning Outcomes

**Statistics: Probability and Descriptive Statistics**
On successful completion, students will be able to
- define probability, random variable, and probability distribution.
- understand the concept of Bayesian statistics.
- grasp the definition of joint and marginal distributions.
- calculate expectation values and higher moments.
- comprehend important inequality equations and limit theorems.

**Statistics - Inferential Statistics**
On successful completion, students will be able to
- understand point estimation methods.
- apply maximum likelihood and ordinary least squares method to estimate parameters.
- comprehend the concept of statistical and systematic errors.
- employ error propagation methods.
- utilize Bayesian inference and non-parametric techniques.
- evaluate statistical tests.
- grasp the fundamentals of statistical decision theory.

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 IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management fields
Statistics: Probability and Descriptive Statistics

Course Code: DLBDSSPDS01

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Course Description
Statistical description and analysis are the foundations for data-driven analysis and prediction methods. This course introduces the fundamentals, beginning with a formal definition of probabilities and introduction to the concepts underlying Bayesian statistics. Random variables and probability density distributions are then discussed, as well as the concept of joint and marginal distributions. The importance of various discrete and continuous distributions and their applications is stressed. Characterizing distributions is an important aspect of describing the behavior of probability distributions. Students are familiarized with expectation values, variance, and covariance. The concepts of algebraic and central moments and moment-generating functions complement the characterization of probability distributions. Finally, this course focuses on important inequalities and limit theorems such as the law of large numbers or the central limit theorem.

Course Outcomes
On successful completion, students will be able to
- define probability, random variable, and probability distribution.
- understand the concept of Bayesian statistics.
- grasp the definition of joint and marginal distributions.
- calculate expectation values and higher moments.
- comprehend important inequality equations and limit theorems.

Contents
1. Probability
   1.1 Definitions
   1.2 Independent events
   1.3 Conditional probability
   1.4 Bayesian statistics
2. Random Variables
   2.1 Random Variables
   2.2 Distribution functions and probability mass functions
   2.3 Important discrete probability distributions
   2.4 Important continuous probability distributions
3. Joint Distributions
   3.1 Joint distributions
   3.2 Marginal distributions
   3.3 Independent random variables
   3.4 Conditional distributions

4. Expectation and Variance
   4.1 Expectation of a random variable, conditional expectations
   4.2 Variance and covariance
   4.3 Expectations and variances of important probability distributions
   4.4 Algebraic and central moments
   4.5 Moment-generating functions

5. Inequalities and Limit Theorems
   5.1 Probability inequalities
   5.2 Inequalities for expectations
   5.3 The law of large numbers
   5.4 Central limit theorem

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- ☐ Learning Sprints®
- ✔ Course Book
- ☐ Vodcast
- ✔ Shortcast
- ✔ Audio
- ✔ Exam Template
- ✔ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
### Study Format myStudies

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☑ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
## Statistics - Inferential Statistics

**Course Code:** DLBDSSIS01

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### Course Description

Statistical analysis and understanding are the foundations of data-driven methods and machine learning approaches. This course gives a thorough introduction to point estimators and discusses various techniques to estimate and optimize parameters. Special focus is given to a detailed discussion of both statistical and systematic uncertainties as well as propagation of uncertainties. Bayesian statistics is fundamental to data-driven approaches, and this course takes a close look at Bayesian techniques such as Bayesian parameter estimation and prior probability functions. Furthermore, this course gives an in-depth overview of statistical testing and decision theory, focusing on aspects such as A/B testing, hypothesis testing, p-values, and multiple testing which are fundamental to statistical analysis approaches in a broad range of practical applications.

### Course Outcomes

On successful completion, students will be able to:

- understand point estimation methods.
- apply maximum likelihood and ordinary least squares method to estimate parameters.
- comprehend the concept of statistical and systematic errors.
- employ error propagation methods.
- utilize Bayesian inference and non-parametric techniques.
- evaluate statistical tests.
- grasp the fundamentals of statistical decision theory.

### Contents

1. **Point Estimation**
   1.1 Method of moments
   1.2 Sufficient statistics
   1.3 Maximum likelihood
   1.4 Ordinary least squares
   1.5 Resampling techniques

2. **Uncertainties**
   2.1 Statistical and systematic uncertainties
   2.2 Propagation of uncertainties
3. Bayesian Inference & Non-parametric Techniques
   3.1 Bayesian parameter estimation
   3.2 Prior probability functions
   3.3 Parzen windows
   3.4 K-nearest-neighbours

4. Statistical Testing
   4.1 A/B testing
   4.2 Hypothesis tests & test statistics
   4.3 P-values & confidence intervals
   4.4 Multiple testing

5. Statistical Decision Theory
   5.1 The risk function
   5.2 Maximum likelihood, Minimax, and Bayes
   5.3 Admissibility and Stein's paradox

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# Study Format Distance Learning

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## Student Workload

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Data Science and object oriented programming with Python

Module Code: DLBSEWDSPP_E

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Module Coordinator
Prof. Dr. Thomas Zöller (Introduction to Data Science) / Prof. Dr. Max Pumperla (Object oriented and functional programming in Python)

Contributing Courses to Module
- Introduction to Data Science (DLBDSIDS01)
- Object oriented and functional programming in Python (DLBDSOOFPP01)

Module Exam Type

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<td>Study Format &quot;Distance Learning&quot;: Portfolio (50)</td>
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Weight of Module
see curriculum

www.iu.org
### Module Contents

**Introduction to Data Science**
- Introduction to Data Science
- Data
- Data Science in Business
- Statistics
- Machine Learning

**Object oriented and functional programming in Python**
This course introduces the students to the advanced programming concepts of object orientation and functional programming and how they are realized in the Python programming language.

### Learning Outcomes

**Introduction to Data Science**
On successful completion, students will be able to
- define data science and its relation to other fields.
- comprehend data science activities.
- recognize the origins of data and the challenges of working with data.
- understand how data science methods are integrated into business settings.
- grasp fundamental statistical concepts.
- appreciate the importance of machine learning in data science.

**Object oriented and functional programming in Python**
On successful completion, students will be able to
- explain basic notions in object-oriented programming such as functions and classes.
- understand object-oriented programming concepts and their relation to software design and engineering.
- describe advanced function concepts in Python.
- recognize important ideas from functional programming.
- recall important libraries for functional programming in Python.

### Links to other Modules within the Study Program
This module is similar to other modules in the fields of Data Science & Artificial Intelligence

### Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the IT & Technology fields
Introduction to Data Science
Course Code: DLBDSIDS01

Course Description
Data science emerged as a multi-disciplinary field aimed at creating value from data. This course starts with an overview of data science and related fields and then defines data types and sources. Special focus is put on the assessment of data quality and electronic data processing. Use of data-driven methods has become vital for businesses, and this course outlines how data-driven approaches can be integrated within a business context and how operational decisions can be made using data-driven methods. Finally, this course highlights the importance of statistics and machine learning in the field of data science and gives an overview of relevant methods and approaches.

Course Outcomes
On successful completion, students will be able to
- define data science and its relation to other fields.
- comprehend data science activities.
- recognize the origins of data and the challenges of working with data.
- understand how data science methods are integrated into business settings.
- grasp fundamental statistical concepts.
- appreciate the importance of machine learning in data science.

Contents
1. Introduction to Data Science
   1.1 Definition of the term „data science”
   1.2 Data science and related fields
   1.3 Data science activities
2. Data
   2.1 Data types and data sources
   2.2 The 5Vs of data
   2.3 Data curation and data quality
   2.4 Data engineering
3. Data Science in Business
   3.1 Identification of use cases
   3.2 Performance evaluation
   3.3 Data-driven operational decisions
   3.4 Cognitive biases

4. Statistics
   4.1 Importance of statistics for data science
   4.2 Important statistical concepts

5. Machine Learning
   5.1 Role of machine learning in data science
   5.2 Overview of machine learning approaches

Literature

Compulsory Reading

Further Reading
Study Format Distance Learning

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| Type of Exam | Oral Assignment |

Student Workload

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Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☐ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed

www.iu.org
Object oriented and functional programming in Python
Course Code: DLBDSOOFPP01

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Course Description
This course builds upon basic knowledge of Python programming (Introduction to Programming with Python, DLBDSIPWP) and is concerned with the exposition of advanced Python programming concepts. To this end, important notions of object-oriented programming like classes and objects and pertaining design principles are outlined. Starting from an in-depth discussion of advanced features of Python functions, functional programming concepts and their implementation in Python are conveyed.

Course Outcomes
On successful completion, students will be able to
- explain basic notions in object-oriented programming such as functions and classes.
- understand object-oriented programming concepts and their relation to software design and engineering.
- describe advanced function concepts in Python.
- recognize important ideas from functional programming.
- recall important libraries for functional programming in Python.

Contents
- This course provides students with a thorough introduction to important notions and concepts from the domain of object-oriented programming such as classes, objects, abstraction, encapsulation, inheritance, polymorphism, composition, and delegation. Additionally, the functional programming paradigm and pertaining ideas like functions as first class objects, decorators, pure functions, immutability and higher order functions are conveyed. Pursuant to the portfolio course type, the aforementioned concepts and ideas are explored by hands-on programming projects.
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## Study Format Distance Learning

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## Student Workload

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
# Internet of Things and Embedded Systems

**Module Code:** DLBSEWITES_E

<table>
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**Module Coordinator**
Prof. Dr. Marian Benner-Wickner (Introduction to the Internet of Things) / N.N. (Embedded Systems)

**Contributing Courses to Module**
- Introduction to the Internet of Things (DLBINGEIT01_E)
- Embedded Systems (DLBROES01_E)

**Module Exam Type**

**Module Exam**

**Split Exam**
- Introduction to the Internet of Things
  - Study Format "Distance Learning": Exam, 90 Minutes
  - Study Format "myStudies": Exam, 90 Minutes
- Embedded Systems
  - Study Format "Distance Learning": Exam, 90 Minutes

**Weight of Module**
see curriculum
Module Contents

Introduction to the Internet of Things
- Internet of Things Fundamentals
- Social and Economic Significance
- Communication Standards and Technologies
- Data Storage and Processing
- Design and Development
- Applicability

Embedded Systems
- Embedded Systems Architecture
- Embedded Hardware
- Embedded Software
- Distributed Systems and IoT Architecture
- Embedded Operating Systems

Learning Outcomes

Introduction to the Internet of Things
On successful completion, students will be able to
- grasp the distinctive features of Internet of Things (IoT) and IoT systems.
- understand the social and economic importance of Internet of Things.
- identify the most important standards for communication between IoT devices.
- differentiate between various techniques for storing and processing data in IoT systems.
- identify different architectures and technologies for structuring IoT systems.
- recognize challenges of data protection and data security in IoT systems.

Embedded Systems
On successful completion, students will be able to
- understand the architecture of embedded systems.
- understand real-time embedded systems.
- design the main architecture of embedded systems for robotics, automation and IoT infrastructure.

Links to other Modules within the Study Program
This module is similar to other modules in the fields of Computer Science & Software and Engineering

Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the IT & Technology fields

www.iu.org
Introduction to the Internet of Things
Course Code: DLBINGEIT01_E

Study Level | Language of Instruction | Contact Hours | CP | Admission Requirements
---|---|---|---|---
BA | English | 5 | none |

Course Description
The aim of this course is to give students an insight into technical and theoretical basics of the Internet of Things (IoT) and its fields of application. In addition to the general structure of IoT systems and the technology standards used in them, students are also taught the importance of Internet of Things for economy and society. Furthermore, this course demonstrates how data is exchanged, stored and processed in IoT.

Course Outcomes
On successful completion, students will be able to
- grasp the distinctive features of Internet of Things (IoT) and IoT systems.
- understand the social and economic importance of Internet of Things.
- identify the most important standards for communication between IoT devices.
- differentiate between various techniques for storing and processing data in IoT systems.
- identify different architectures and technologies for structuring IoT systems.
- recognize challenges of data protection and data security in IoT systems.

Contents
1. Internet of Things Fundamentals
   1.1 The Internet of Things - Basics and Motivation
   1.2 Evolution of the Internet - Web 1.0 to Web 4.0

2. Social and Economic Significance
   2.1 Innovations for Consumers and Industry
   2.2 Implications on People and the World of Work
   2.3 Data Protection and Data Security

3. Communication Standards and Technologies
   3.1 Network Topologies
   3.2 Network Protocols
   3.3 Technologies
4. Data Storage and Processing
   4.1 Networked Storage with Linked Data and RDF(S)
   4.2 Analysis of Networked Data using a Semantic Reasoner
   4.3 Processing of Data Streams with Complex Event Processing
   4.4 Operation and Analysis of Large Data Clusters using NoSQL and MapReduce

5. Design and Development
   5.1 Software Engineering for Distributed and Embedded Systems
   5.2 Architecture Styles and Patterns of Distributed Systems
   5.3 Platforms: Microcontrollers, Monoboard Computers, One-Chip Systems

6. Applicability
   6.1 Smart Home / Smart Living
   6.2 Ambient Assisted Living
   6.3 Smart Energy / Smart Grid
   6.4 Smart Factory
   6.5 Smart Logistics

**Literature**

**Compulsory Reading**

**Further Reading**
### Study Format Distance Learning

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### Instructional Methods

- [ ] Learning Sprints®
- [✓] Course Book
- [ ] Vodcast
- [✓] Shortcast
- [✓] Audio
- [✓] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [✓] Live Tutorium/Course Feed
### Study Format myStudies

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Embedded Systems
Course Code: DLBROES01_E

Study Level | Language of Instruction | Contact Hours | CP | Admission Requirements
------------|-------------------------|---------------|----|------------------------
BA          | English                 | 5             | none

Course Description
Embedded systems are required to make functional engineering systems operational. Through embedding microprocessor-based systems capable of networking, data exchange and processing, the functionality of products and systems can be enhanced in terms of features, precision, accuracy, dynamic properties, and intelligence. In this sense, an embedded system is the place where everything begins. This course provides the basics on embedded systems, by focusing on the architectural patterns of modern systems and platforms. The embedded hardware and software aspects are addressed. An emphasis of this course is given to connectivity and networking aspects to build distributed systems for the internet of things and the industrial internet of things (with the final purpose of conceptualizing cyber-physical systems). The course closes with an overview on existing common embedded operating systems.

Course Outcomes
On successful completion, students will be able to

- understand the architecture of embedded systems.
- understand real-time embedded systems.
- design the main architecture of embedded systems for robotics, automation and IoT infrastructure.

Contents
1. Introduction
   1.1 Embedded Systems Design
   1.2 Embedded Systems Architecture
   1.3 Embedded Systems Models
   1.4 Standards, Compilers and Programming Languages

2. Embedded Hardware
   2.1 Schematics
   2.2 Basic Components
   2.3 Embedded Processors
   2.4 Board Memory
   2.5 Board I/O
   2.6 Buses
3. Embedded Software
   3.1 Device Drivers
   3.2 Scheduling Basics
   3.3 State Machines
   3.4 Interrupts
   3.5 Watchdogs
   3.6 Embedded Operating Systems
   3.7 Middleware

4. Distributed Systems and IoT Architecture
   4.1 Network Interfaces (Ethernet, WiFi, 6LoWPAN, Bluetooth...)
   4.2 The Internet Protocol
   4.3 Transport Layer Security
   4.4 Application Protocols (Message protocols, REST)

5. Embedded Operating Systems
   5.1 Task Management
   5.2 Scheduler
   5.3 Synchronization
   5.4 System Resource Separation
   5.5 Examples of Embedded Operating Systems

Literature

Compulsory Reading

Further Reading

### Study Format Distance Learning

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
## Robotics and Production Engineering

**Module Code:** DLBSEWRI_E

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### Module Coordinator

Prof. Dr. Matthias Eifler (Introduction to Robotics) / Prof. Dr. Mario Boßlau (Production Engineering)

### Contributing Courses to Module

- Introduction to Robotics (DLBROIR01_E)
- Production Engineering (DLBDSEAR01)

### Module Exam Type

#### Module Exam

**Split Exam**

- Introduction to Robotics
  - Study Format "Distance Learning": Exam or Written Assessment: Written Assignment, 90 Minutes
  - Study Format "myStudies": Exam or Written Assessment: Written Assignment, 90 Minutes

- Production Engineering
  - Study Format "myStudies": Exam, 90 Minutes
  - Study Format "Distance Learning": Exam, 90 Minutes (50)

### Weight of Module

see curriculum
## Module Contents

### Introduction to Robotics
- Introduction to Robotics
- Trends
- Industrial Robots
- Mobile Robots
- Applications

### Production Engineering
- Introduction to Manufacturing Technology
- Main Production Groups According to DIN 8580
- Additive Manufacturing Processes
- Rapid Prototyping
- Rapid Tooling
- Direct/Rapid Manufacturing
- Cyber-Physical Production Plants

## Learning Outcomes

### Introduction to Robotics
On successful completion, students will be able to
- name important developments in the field of robotics.
- understand the mechanical structure and characteristics of robots.
- name characteristics and challenges of industrial robots.
- name characteristics and challenges of mobile robots.
- understand the role of robots in applications.
- name and understand current trends in the field of robotics.

### Production Engineering
On successful completion, students will be able to
- understand the basic concepts and interrelationships of production engineering.
- understand current changes in manufacturing technology due to technologies such as additive manufacturing and megatrends such as cyber physical systems.
- assign different manufacturing processes to the main manufacturing groups according to DIN 8580.
- understand the basic principle of additive manufacturing processes.
- distinguish between different additive manufacturing processes.
- understand the terms Rapid Prototyping, Rapid Tooling, and Direct Manufacturing and name individual processes and application examples.
- understand the elements and properties of cyber-physical production plants.
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Introduction to Robotics

Course Code: DLBROIR01_E

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Course Description
Robotics is experiencing very interesting developments, which experts describe as being a transition to a new generation of robots. We have moved from the “4Ds” of Robotics 1.0 (dull, dirty, dumb, dangerous) to the “4Ss” of Robotics 2.0 (smarter, safer, sensors, simple), but we still need to proceed further to the “4Ms” of Robotics 3.0 (multitasking, emotive, morphing, multiagent). This course, thus, provides the required background to understand the main development of robotics looking at industrial as well as at mobile robots, their main characteristics, issues, challenges, applications, and development trends.

Course Outcomes
On successful completion, students will be able to

- name important developments in the field of robotics.
- understand the mechanical structure and characteristics of robots.
- name characteristics and challenges of industrial robots.
- name characteristics and challenges of mobile robots.
- understand the role of robots in applications.
- name and understand current trends in the field of robotics.

Contents
1. What is Robotics?
   1.1 Basics and Definitions
   1.2 History and Cultural Influence
   1.3 Challenges and Trends (from Robotics 1.0 to Robotics 3.0)

2. Robots
   2.1 Mechanical Structure
   2.2 Kinematic Chains
   2.3 Market Overview
3. **Industrial Robots**
   3.1 Components of Industrial Robot Systems
   3.2 Characteristics
   3.3 Common Industrial Robots
   3.4 Applications
   3.5 Trends

4. **Mobile Robots**
   4.1 Components of Mobile Robot Systems
   4.2 Characteristics
   4.3 Common Mobile Robots
   4.4 Applications
   4.5 Trends

5. **Applications**
   5.1 Industrial Robots
   5.2 Healthcare
   5.3 Agriculture or Field Robotics
   5.4 Space and Defense
   5.5 Warehouse and Logistics
   5.6 Construction
   5.7 Wearables
   5.8 Social Robots

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**Literature**

**Compulsory Reading**

**Further Reading**

- Siciliano, B., & Khatib, O. (Eds.). (2016). Springer handbook of robotics. Springer
### Study Format Distance Learning

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| Type of Exam | |
|--------------| Exam or Written Assessment: Written Assignment, 90 Minutes |

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed
**Study Format myStudies**

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Exam or Written Assessment: Written Assignment, 90 Minutes

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**Instructional Methods**

- [ ] Learning Sprints®
- [x] Course Book
- [ ] Vodcast
- [x] Shortcast
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- [x] Guideline
- [x] Live Tutorium/Course Feed
Production Engineering
Course Code: DLBDSEAR01

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Course Description
The aim of the course is to provide students with an overview of the processes that have influenced and still influence production processes through technological developments under the generic term Industry 4.0, based on traditional, standardized manufacturing techniques. These include, in particular, technological advances in additive manufacturing processes that enable applications such as rapid prototyping, rapid tooling, and direct manufacturing. Finally, the course deals with the consequences of the digitalization and networking of production facilities and their elements in the sense of a cyber-physical system.

Course Outcomes
On successful completion, students will be able to
- understand the basic concepts and interrelationships of production engineering.
- understand current changes in manufacturing technology due to technologies such as additive manufacturing and megatrends such as cyber physical systems.
- assign different manufacturing processes to the main manufacturing groups according to DIN 8580.
- understand the basic principle of additive manufacturing processes.
- distinguish between different additive manufacturing processes.
- understand the terms Rapid Prototyping, Rapid Tooling, and Direct Manufacturing and name individual processes and application examples.
- understand the elements and properties of cyber-physical production plants.

Contents
1. Introduction to Manufacturing Technology
   1.1 Basic Terms and Contexts in Manufacturing Theory
   1.2 Historical Development of Production
   1.3 The Discussion About the Long Tail
2. Main Production Groups According to DIN 8580
   2.1 Archetypes
   2.2 Reshaping
   2.3 Cutting (Cutting, Machining, Ablation)
   2.4 Joining
   2.5 Coating
   2.6 Substance Property Changes

3. Additive Manufacturing Processes
   3.1 Basic Principles and Legal Aspects
   3.2 Stereolithography (STL)
   3.3 Selective Laser Sintering and Selective Beam Melting With Laser or Electron Beam
   3.4 Fused Deposition Modeling (FDM)
   3.5 Multi-Jet Modeling (MJM) and Poly-Jet Process (PJM)
   3.6 3D Printing Process (3DP)
   3.7 Laminating Processes
   3.8 Mask Sintering

4. Rapid Prototyping
   4.1 Definition
   4.2 Strategic and Operational Aspects
   4.3 Application Areas and Examples

5. Rapid Tooling
   5.1 Definition, Strategic, and Operational Aspects
   5.2 Indirect and Direct Procedures

6. Direct/Rapid Manufacturing
   6.1 Potentials and Requirements for Procedures
   6.2 Implementation, Application Areas, and Examples

7. Cyber-Physical Production Plants
   7.1 Derivation of the Terms Industry 4.0 and Cyber-Physical Systems
   7.2 Megatrend Cyber Physical Systems (CPS)
   7.3 Definition Cyber-Physical Production Plant
   7.4 Effects on Planning and Operation of Production Facilities
   7.5 Dynamic Reconfiguration and Migration of Production Facilities
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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
**Study Format Distance Learning**

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**Instructional Methods**

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- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
International Management and Leadership
Module Code: DLBSEWIML_E

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Module Coordinator
Prof. Dr. Jürgen Matthias Seeler (International Management) / N.N. (Leadership 4.0)

Contributing Courses to Module
- International Management (BWINT01)
- Leadership 4.0 (DLBWPLS01_E)

Module Exam Type

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Weight of Module
see curriculum
Module Contents

International Management
- Globalization and the internationalization of business
- Assessment of political, legal, economic, and cultural Contexts
- Strategy in international business
- Organization in international business
- Marketing in international business
- Human resource management in international business

Leadership 4.0
- Conventional understanding of leadership
- Management tools
- Leadership versus management
- Integral concept of humankind as future-oriented model
- Characteristics and competencies of leaders
- Leadership models
- Agile Leadership instruments
## Learning Outcomes

### International Management

On successful completion, students will be able to

- recognize and explain the cultural, social, economic, historical, and political differences that affect strategic decision making on an international/global scale.
- gather specific information and conduct reliable assessments of the opportunities and risks related to business activities in different geographical market regions and specific national markets.
- describe the impact of culture on international business activities.
- identify different options for market entry and market development and participate in strategic planning activities that address these issues.
- design and evaluate different organizational structures for international businesses and design measures to optimize organizational structures for international operations.
- design, evaluate, and optimize human resource management practices for global and multinational companies.
- explain options for international marketing and select an appropriate marketing mix relative to specific products/services and the target market.
- identify and manage challenges associated with operating in an international/global business environment, such as the procurement and coordination of resources and human resource management.
- develop business plans that implement specific organizational, marketing, and distribution strategies in selected regions/countries.

### Leadership 4.0

On successful completion, students will be able to

- understand the classical theories of leadership and new leadership models.
- distinguish between the terms leadership and management.
- reflect on the understanding of successful leadership models against the background of economic changes.
- develop an understanding of the need for alternative forms of organizational directing.
- implement appropriate leadership methods according to a company’s level of complexity.
- draw upon a sound theoretical understanding that they can practice in applied research.

## Links to other Modules within the Study Program

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

## Links to other Study Programs of IU

International University of Applied Sciences

All Bachelor Programs in the Business & Management field
International Management
Course Code: BWINT01

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Course Description
Globalization presents multiple opportunities and challenges to product and service industries. Many companies previously engaged in local markets must consider global trends and international markets, both on the demand and on the supply side. With this, comes new opportunities to market products and services. At the same time, complexity in daily business increases and managers have to face ambiguities and frequently changing contexts. With more competition, more diverse markets, and cultural, political, and legal challenges abroad, it has become more difficult to manage a company efficiently. All these factors call for managers to adopt a global mindset and sufficient cultural sensitivity. The course is designed to cover the economic, organizational, and cultural underpinnings that students need to grasp in order to better understand the managerial challenges that global organizations of all types and sizes have to cope with. Participants of this course will be provided with empirical knowledge and first-hand experiences of international management. Through multiple case studies within the course book, online lectures, and tutorials, students will develop a detailed understanding of the strategies and operational patterns necessary to successfully operate in international markets.
**Course Outcomes**

On successful completion, students will be able to

- recognize and explain the cultural, social, economic, historical, and political differences that affect strategic decision making on an international/global scale.
- gather specific information and conduct reliable assessments of the opportunities and risks related to business activities in different geographical market regions and specific national markets.
- describe the impact of culture on international business activities.
- identify different options for market entry and market development and participate in strategic planning activities that address these issues.
- design and evaluate different organizational structures for international businesses and design measures to optimize organizational structures for international operations.
- design, evaluate, and optimize human resource management practices for global and multinational companies.
- explain options for international marketing and select an appropriate marketing mix relative to specific products/services and the target market.
- identify and manage challenges associated with operating in an international/global business environment, such as the procurement and coordination of resources and human resource management.
- develop business plans that implement specific organizational, marketing, and distribution strategies in selected regions/countries.

**Contents**

1. Introduction to International Management
   1.1 What is Globalization?
   1.2 Facts about Globalization and the Global Economy
   1.3 Theoretical Explanations for Globalization

2. The International Company and its Environment
   2.1 International Companies and their Operations
   2.2 Operational Patterns in International Markets
   2.3 Assessment of the Environment for Internalization

3. Culture and International Business
   3.1 A Generic Perspective on Culture
   3.2 Organizational Culture
   3.3 Cultural Diversity and the Contemporary Manager
4. Strategy Development in International Business
   4.1 Strategy in Globalized Business Operations
   4.2 Strategy Concepts and Strategic Options
   4.3 Managing Strategy

5. International Human Resource Management
   5.1 Characteristics of International Human Resource Management
   5.2 The Global Manager
   5.3 Instruments in International Human Resource Management

6. Organization in International Business
   6.1 Traditional Perspectives on Business Organization
   6.2 Modern Views on Business Organization
   6.3 Coordination of Intra-Organization Collaboration

7. International Marketing
   7.1 Marketing in International Business
   7.2 Strategic Choices in International Marketing
   7.3 Marketing Mix Choices in International Marketing

Literature

**Compulsory Reading**

**Further Reading**

**Study Format Distance Learning**

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**Instructional Methods**

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
Leadership 4.0
Course Code: DLBWPLS01_E

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Course Description
Today, competitiveness depends more than ever on continuous innovation. This puts new demands on the management of companies. The task of successful leaders in innovation and business is no longer to offer direction and solutions, but to create a framework in which others develop innovations. This change, which is currently taking place with full force in companies, requires further developments on classic leadership concepts and its principles. Against the background of digital change and the advance of artificial intelligence, established business models are constantly being put to the test. On the one hand, it is important to work on several projects simultaneously and to adapt flexibly to changing conditions at any time; on the other hand, employees want to be integrated into the work process in a different way. Consideration and flexibility for their personal and family situation play an increasing role. Innovation and business leaders can only meet all these diverse challenges with Leadership by inspiring others to think ahead and act inter-divisionally, in other words, to be visionary. This course tries to convey knowledge, understanding and tools for this challenging field of work.

Course Outcomes
On successful completion, students will be able to

▪ understand the classical theories of leadership and new leadership models.
▪ distinguish between the terms leadership and management.
▪ reflect on the understanding of successful leadership models against the background of economic changes.
▪ develop an understanding of the need for alternative forms of organizational directing.
▪ implement appropriate leadership methods according to a company’s level of complexity.
▪ draw upon a sound theoretical understanding that they can practice in applied research.

Contents
1. Basics of the Leadership Concept
   1.1 Definition of the Leadership Concept and Leadership Actions
   1.2 Development of the Understanding of Leadership
   1.3 The Role of Communication in Leadership
   1.4 New Challenges for Leadership
2. Leadership Versus Management
   2.1 Distinctions between these Concepts
   2.2 Relevance of Leadership in the Context of Technological Change
   2.3 New Forms of Work as a Challenge for Leadership 4.0

3. Organizational Prerequisites for Successful Leadership
   3.1 Launching Corporate Governance Initiatives
   3.2 From Process to Project Management
   3.3 Managing Limited Resources

4. Personal Factors for Successful Leadership
   4.1 Personal Characteristics
   4.2 Technological Know-how
   4.3 Policy and Compliance

5. Management Tools
   5.1 Definition, Differentiation and Challenges
   5.2 Use of Direct Management Tools
   5.3 Use of Indirect Management Tools

6. Leadership 4.0 Models
   6.1 Transformational Leadership
   6.2 Leadership as an Agile Role
   6.3 Authentic Leadership

7. Leadership 4.0 Case Studies
   7.1 Allsafe Jungfalk
   7.2 Automattic
## Literature

### Compulsory Reading

#### Further Reading

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Instructional Methods

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- [ ] Guideline
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# International Marketing and Branding

**Module Code:** DLBDSEIMB

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### Module Coordinator

Caterina Fox (International Marketing) / N.N. (International Brand Management)

### Contributing Courses to Module

- International Marketing (DLBDSEIMB01)
- International Brand Management (DLBDSEIMB02)

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| International Brand Management |
| • Study Format "myStudies": Exam, 90 Minutes |
| • Study Format "Distance Learning": Module Exam (50) |

### Weight of Module

see curriculum
## Module Contents

### International Marketing
- International marketing strategy
- Cultural differences and their significance for marketing
- International marketing mix (product, price, promotion, and distribution decisions in an international environment)
- International market research and consumer behavior
- Ethical aspects in international marketing
- International marketing controlling and six sigma

### International Brand Management
- Basics of brand management
- Framework conditions for brands in international markets
- Strategies and concepts of international brands
- Brand architectures and brand extension options
- Brand management and communication
- Brand management according to the stakeholder concept
- Brand control and protection

## Learning Outcomes

### International Marketing
On successful completion, students will be able to
- understand basic aspects of international strategic marketing.
- analyze cultural differences and their impact on international marketing.
- apply selected concepts of the international marketing mix.
- describe the possibilities of international market research and its influence on consumer behavior.
- recognize the necessity of international brand controlling and quality management.
- reproduce theoretical knowledge using case studies.

### International Brand Management
On successful completion, students will be able to
- recognize the significance of a brand and the general conditions under which brands operate, as well as the associated tasks of brand management.
- describe the components of a brand and its management.
- explain the positioning of brands on regional, national and international markets.
- understand the role of brand evaluation and compare the most common measurement techniques.
- give an overview of the importance of trademark protection and suggest strategies for preventing counterfeiting.
- conceive of brand strategies and measures for the avoidance or occurrence of brand crises.
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<td>All Bachelor Programmes in the Marketing &amp; Communication fields</td>
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Course Description
Students are taught the necessity for strategic marketing in an international context. They will learn about essential cultural differences and their influences on international marketing management. The basic decisions, standardizations, and adaptations in international marketing are experienced by the students on the basis of different concepts in the international marketing mix. The necessity of international market research, strategic planning, and control are taught to the students, along with the ethical aspects in international marketing. The students analyze current topics in international marketing management and reflect on them in connection with the concepts they have learned in this course.

Course Outcomes
On successful completion, students will be able to
- understand basic aspects of international strategic marketing.
- analyze cultural differences and their impact on international marketing.
- apply selected concepts of the international marketing mix.
- describe the possibilities of international market research and its influence on consumer behavior.
- recognize the necessity of international brand controlling and quality management.
- reproduce theoretical knowledge using case studies.

Contents
1. Strategic International Marketing
   1.1 Internationalization
   1.2 Theoretical Foundations of International Market Entry Strategies
   1.3 Forms of International Market Entry

2. Cultural Differences as an Aspect of International Marketing
   2.1 Overview of Culture
   2.2 Cultural Model Based on Hofstede
   2.3 Cultural Model Based on Trompenaars
3. Case Studies in International Market Entry and Marketing Strategies
   3.1 Case Study: Nivea in South Korea
   3.2 Case Study: Bosch and Siemens Hausgeräte GmbH in China
   3.3 Case Study: Siemens Mobile in China
   3.4 Case Study: Siemens in China

4. International Product Management and Product Development
   4.1 Goals of International Product Management
   4.2 Framework Conditions for International Product Management
   4.3 International Product Decisions
   4.4 International Product Development

5. Exchange Rate Fluctuations and International Price Calculation
   5.1 Tasks and Objectives of International Price Management
   5.2 Factors Influencing International Price Management
   5.3 Instruments of International Price Management

6. International Communication and International Sales Policy
   6.1 International Communication Management
   6.2 International Sales Management

7. International Marketing and Ethics
   7.1 Overview of International Marketing and Ethics
   7.2 Business Ethics in International Companies
   7.3 Case Study: Nestlé

8. Applied Market Research and Its Influence on Consumer Behavior
   8.1 Scope of International Market Research
   8.2 Requirements for International Market Research Information
   8.3 International Secondary Research
   8.4 International Primary Research

9. Monitoring and Control in International Marketing
   9.1 Controlling in International Management

10. Six Sigma, Brand Management, and Rebranding
    10.1 Six Sigma: Basics, Definitions, and Processes
    10.2 Brand Management
    10.3 Rebranding
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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
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- Shortcut
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
International Brand Management
Course Code: DLBDSEIMB02

Course Description
The aim of this course is to deepen and expand the knowledge acquired in the introductory elective course International Marketing. The value of a brand is a decisive competitive advantage for companies in international business. Brands create long-term and profitable customer relationships. Brands are therefore valuable assets for companies and organizations. Students learn the basics of brand management before moving on to the concepts and success factors of international brand management. Students also become familiar with the structure of brand architectures and the possibilities of brand extensions. The fact that different stakeholder groups must be taken into account in brand management is communicated to the students on the basis of the stakeholder concept. In addition, the students get to know the various methods for measuring brand value and brand controlling. The aspects of trademark protection that are particularly important in an international environment will be dealt with conclusively.

Course Outcomes
On successful completion, students will be able to
- recognize the significance of a brand and the general conditions under which brands operate, as well as the associated tasks of brand management.
- describe the components of a brand and its management.
- explain the positioning of brands on regional, national and international markets.
- understand the role of brand evaluation and compare the most common measurement techniques.
- give an overview of the importance of trademark protection and suggest strategies for preventing counterfeiting.
- conceive of brand strategies and measures for the avoidance or occurrence of brand crises.

Contents
1. Basics of Brand Management
   1.1 Brand Significance and Brand Understanding
   1.2 Market Conditions
   1.3 Tasks and Goals of Brand Management
2. Brand Identity, Brand Positioning, and Brand Personality
   2.1 Brand Identity as the Basis of Brand Management
   2.2 Brand Positioning
   2.3 Brand Image
   2.4 Brand Personality

3. Brand Strategies
   3.1 The Challenges for Brand Strategies
   3.2 Brand Strategies for New Products
   3.3 Trademark Licensing

4. International Branding
   4.1 Importance of Branding for International Companies
   4.2 Brand Concepts for International Brands
   4.3 Factors for Successful International Brands

5. Brand Architectures and Types of Branding
   5.1 Brand Hierarchies
   5.2 Co-branding and Ingredient Branding

6. Brand Management and Communication
   6.1 Classic Brand Communication
   6.2 Brand Communication on the Internet

7. Brand Expansion
   7.1 Basics of Brand Extension
   7.2 Opportunities and Risks of Brand Extension
   7.3 Ideal Typical Sequence of the Brand Extension Process

8. Brand Management According to the Stakeholder Concept
   8.1 Basics of Brand Management According to the Stakeholder Principle
   8.2 Stakeholder Groups: Consumer Stakeholder Groups
   8.3 Stakeholder Groups: Shareholders and Financial Investors
   8.4 Stakeholder Groups: Employees
   8.5 Stakeholder Groups: Suppliers and the Public
9. Brand Control
   9.1 Basics of Brand Controlling
   9.2 Importance and Measurement of Brand Value (Brand Status Analyses)
   9.3 Practical Methods for Measuring Brand Value

10. Trademark Protection
    10.1 Object of Trademark Protection
    10.2 Origin of Trademark Protection
    10.3 Trademark Infringements

Literature

Compulsory Reading

Further Reading

Study Format myStudies

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Instructional Methods

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www.iu.org
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- Creative Lab
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# Applied Sales

**Module Code:** DLBDSEAS

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**Module Coordinator**

Prof. Dr. Patrick Geus (Applied Sales I) / Prof. Dr. Patrick Geus (Applied Sales II)

**Contributing Courses to Module**

- Applied Sales I (DLBDSEAS01)
- Applied Sales II (DLBDSEAS02)

**Module Exam Type**

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**Weight of Module**

see curriculum
### Module Contents

#### Applied Sales I
- Fundamentals of Applied Sales
- The Distribution System
- Personal Sales
- Sales Plans
- New Customer Acquisition
- A Sales Visit
- Conversational Tactics
- Conducting Negotiations
- Other Sales Channels

#### Applied Sales II
- Marketing and Sales
- Customer Satisfaction as a Success Factor
- Personalities in Sales
- Customer-Oriented Communication
- Presentation and Rhetoric
- Customer Loyalty
- Networking
- Case Study
Learning Outcomes

Applied Sales I
On successful completion, students will be able to

▪ understand the fundamentals of applied sales and place them in the context of the company.
▪ understand the interaction of the individual facets of applied sales.
▪ differentiate between and evaluate individual sales systems.
▪ describe current sales types and sales characteristics.
▪ oversee and classify the entire sales process from customer acquisition to customer retention.
▪ understand the basics of sales and negotiation management and apply them.
▪ name the usual sales instruments, recognize their advantages and disadvantages, and reflect on essential fields of application and possibilities.

Applied Sales II
On successful completion, students will be able to

▪ understand the interaction and the respective areas of responsibility of marketing and sales.
▪ reflect on and classify the goals and measures within the framework of the applied sales system.
▪ assess the relevance of customer satisfaction and retention. In addition, the students will be familiar with the central design elements of CRM.
▪ reflect on and assess alternative approaches to customer loyalty and relationship management and apply them in business practice.
▪ understand the meaning of the terms customer life cycle and customer value, and develop approaches to manage them in the sense of the respective sales targets.
▪ use descriptive presentation techniques in order to convince customers and other sales partners.
▪ understand the relevance of networking and develop strategies to broaden the contact base.
▪ develop and evaluate their own market analyses and sales concepts on the basis of practical experience within the framework of the case study.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the Marketing & Communication fields
Applied Sales I
Course Code: DLBDSEAS01

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Course Description
The demands on sales thinking are growing every day. Globalized demand combined with high competition is making it increasingly difficult for companies to compete for customers. At the same time, customers are becoming better informed, while traditional supply markets are saturated and at overcapacity. In order to be successful in such an environment, sales thinking and action are required along with a new type of salesperson. Within the course Applied Sales I (Introduction), the participants are familiarized with the basic concepts of applied sales. You will learn about sales organization, dealing with alternative sales channels, and get to know the dedicated sales planning process. The contents of the module are complemented by the successful acquisition of new customers, whereby particular attention is paid to the organization and implementation of customer visits and the conduct of discussions and negotiations.

Course Outcomes
On successful completion, students will be able to
- understand the fundamentals of applied sales and place them in the context of the company.
- understand the interaction of the individual facets of applied sales.
- differentiate between and evaluate individual sales systems.
- describe current sales types and sales characteristics.
- oversee and classify the entire sales process from customer acquisition to customer retention.
- understand the basics of sales and negotiation management and apply them.
- name the usual sales instruments, recognize their advantages and disadvantages, and reflect on essential fields of application and possibilities.

Contents
1. Fundamentals of Applied Sales and Distribution
   1.1 Tasks and Forms of Applied Distribution
   1.2 Marketing as the Basis of Sales
   1.3 Distribution, Sales, and Other Terms
   1.4 Sales in Different Economic Sectors
2. The Distribution System
   2.1 Forms of Sales
   2.2 Sales Organisation
   2.3 Key Account Management
   2.4 Multi-Channel Distribution

3. Personal Sales
   3.1 The "New Sellers"
   3.2 Requirements for Sales Personalities
   3.3 The Key Account Manager
   3.4 Task of Sales Managers

4. Sales Plan
   4.1 Tasks and Objectives of Sales Management
   4.2 Observation of Competition in the Context of Sales Management
   4.3 Potential Analyses and Sales Planning
   4.4 Sales Control and Visit Strategies

5. New Customer Acquisition
   5.1 Identification of New Customer Potential
   5.2 Customer Relationship Management and Customer Acquisition
   5.3 Trade Fairs and Events
   5.4 Networking

6. The Sales Visit
   6.1 Frequency and Preparation of Visits
   6.2 Conduct of a Visit
   6.3 Visit Reports and Follow-Up
   6.4 Aftercare and Follow-Up

7. Conversational Tactics
   7.1 Structured Conversation Preparation
   7.2 Goal-Oriented Conversation: The D.A.L.A.S Model
   7.3 Questioning Techniques
8. Conducting Negotiations
   8.1 Psychology of Negotiation
   8.2 Negotiation Structure
   8.3 Objection Handling
   8.4 Price Negotiations

9. Other Sales Channels
   9.1 Telemarketing
   9.2 Catalogue and Brochure Sales
   9.3 Internet and E-Commerce

Literature

Compulsory Reading

Further Reading
**Study Format Distance Learning**

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| Type of Exam | Exam |

**Student Workload**

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**Instructional Methods**

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed

www.iu.org
Applied Sales II
Course Code: DLBDSEAS02

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Course Description
The course Applied Sales II builds on the basics taught in the course "Applied Sales I" and broadens and deepens them. First, the tension between marketing and sales is examined in more detail. Based on this, essential backgrounds and central target figures for successful sales management (e.g., customer satisfaction and loyalty as well as the customer life cycle) are derived and operationalized in order to create the basis for efficient and effective customer relationship management. As the process progresses, attention will also be paid to mental processes and consumer behavior in general. In addition, strategies and paths to successful negotiation are deepened and supplemented by convincing communication techniques. The course concludes with a case study in the course of which the students have the opportunity to apply what they have learned in a practice-oriented manner.

Course Outcomes
On successful completion, students will be able to

- understand the interaction and the respective areas of responsibility of marketing and sales.
- reflect on and classify the goals and measures within the framework of the applied sales system.
- assess the relevance of customer satisfaction and retention. In addition, the students will be familiar with the central design elements of CRM.
- reflect on and assess alternative approaches to customer loyalty and relationship management and apply them in business practice.
- understand the meaning of the terms customer life cycle and customer value, and develop approaches to manage them in the sense of the respective sales targets.
- use descriptive presentation techniques in order to convince customers and other sales partners.
- understand the relevance of networking and develop strategies to broaden the contact base.
- develop and evaluate their own market analyses and sales concepts on the basis of practical experience within the framework of the case study.
8. Case Study in IQ Media Marketing
   8.1 The Market Situation
   8.2 The Marketing Situation
   8.3 IQ Media Marketing and IQ Digital Media Marketing

Literature

Compulsory Reading

Further Reading

### Study Format Distance Learning

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| Type of Exam | Exam |

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
## Supply Chain Management

**Module Code:** DLBDSESCM

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### Module Coordinator

Prof. Dr. Hubert Vogl (Supply Chain Management I) / N.N. (Supply Chain Management II)

### Contributing Courses to Module

- Supply Chain Management I (DLBDSESCM01)
- Supply Chain Management II (DLBDSESCM02)

### Module Exam Type

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### Weight of Module

see curriculum
Module Contents

Supply Chain Management I
- Historical and terminological aspects of the SCM concept
- Motives for the creation of cross-company value creation networks
- Design principles and effects of value creation networks
- Logistical core processes and SCM
- Information technology aspects of the SCM concept
- Coordination and collaboration of the network partners
- Industry-specific solutions of the SCM

Supply Chain Management II
- Strategic aspects of SCM
- SCM Practice: Tasks and Activities in the Core Planning Process
- SCM Practice: Tasks and Activities in the Core Process of Procurement
- SCM Practice: Tasks and Activities in the Core Process Production
- SCM Practice: Tasks and Activities in the Core Distribution Process
Learning Outcomes

Supply Chain Management I

On successful completion, students will be able to

▪ explain the importance of cross-company value creation processes.
▪ understand common concepts for modeling cross-company value creation processes.
▪ understand dynamic effects in supply chains and can systematize their causes and effects.
▪ explain important theoretical concepts for describing the characteristics and challenges of cross-company value creation processes.
▪ explain the approaches and problem categories commonly used in the context of supply chain management.
▪ understand important reference and/or management models for the concretization of supply chain systems.
▪ name and detail important roles and tasks in the SCM network.
▪ deal with the coordination problem of SCM and describe the common solution approaches.

Supply Chain Management II

On successful completion, students will be able to

▪ systematically explain the strategic relevance of enterprise-wide value creation processes.
▪ understand the most important tasks and problems in the SCM core process planning.
▪ systematize the elements and interrelationships in the CPFR model in a differentiated way.
▪ be familiar with the characteristics and peculiarities of contract logistics.
▪ understand the most important tasks and problems in the SCM core process procurement.
▪ explain central elements and characteristics of a procurement strategy.
▪ understand the most important tasks and problems in the SCM core process production.
▪ explain central elements and characteristics of a modern production strategy.
▪ understand the most important tasks and problems in the SCM core process distribution.
▪ explain central elements and characteristics of the so-called ECR concept.

Links to other Modules within the Study Program

This module is similar to other modules in the fields of Logistics & Transportation

Links to other Study Programs of IU
International University of Applied Sciences
All Bachelor Programmes in the Transport & Logistics fields

www.iu.org
Supply Chain Management I
Course Code: DLBDSESCM01

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Course Description
SCM proves to be an extremely multi-faceted construct from both a theoretical and a practical point of view. An adequate understanding of the problem dimensions and modes of action of (global) cross-company value creation networks requires a multidimensional approach. It starts by considering logistical processes, with modern process, flow, and network standards forming an important basis for SCM. On the basis of such an approach, students should gain a fundamental understanding of SCM. From the point of view of a holistic approach, it also makes sense to also examine a number of other typical problem areas in addition to the logistical challenges of this concept. This includes IT aspects of SCM (e.g., APS systems), and questions to do with the collaboration and coordination of network partners. This course also considers selected industry specific SCM solutions (ECR or VMI).

Course Outcomes
On successful completion, students will be able to
- explain the importance of cross-company value creation processes.
- understand common concepts for modeling cross-company value creation processes.
- understand dynamic effects in supply chains and can systematize their causes and effects.
- explain important theoretical concepts for describing the characteristics and challenges of cross-company value creation processes.
- explain the approaches and problem categories commonly used in the context of supply chain management.
- understand important reference and/or management models for the concretization of supply chain systems.
- name and detail important roles and tasks in the SCM network.
- deal with the coordination problem of SCM and describe the common solution approaches.

Contents
1. Fundamentals of the Supply Chain Concept
   1.1 Terminological and Conceptual Fundamentals
   1.2 Supply Chain Typology According to Otto
   1.3 Supply Chain Typology According to Bechtel/Jayaram
   1.4 Dynamic Aspects of Supply Chains
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<td>3.3 Supply Chain Management as an Evolutionary Step in Logistics</td>
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<td>5.1 Basic Information on the Concept of Coordination</td>
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<td>5.2 Coordination Concepts, Context, and Perspectives of SCM</td>
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### Literature

#### Compulsory Reading

**Further Reading**

### Study Format myStudies

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### Instructional Methods

- [ ] Learning Sprints®
- [x] Course Book
- [ ] Vodcast
- [x] Shortcast
- [x] Audio
- [x] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
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Study Format Distance Learning

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Instructional Methods

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- Live Tutorium/Course Feed
Supply Chain Management II
Course Code: DLBDSESCM02

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Course Description
From the perspective of strategic management research and practice, the activities covered by the term SCM are closely related to efforts to build and/or maintain a stable operational competitive advantage. A fundamental discussion of this relationship forms the starting point for the course. On this basis, a differentiated analysis of strategy-relevant activities and instruments in the Plan, Source, Make, Deliver, and Return process categories is then carried out using the SCOR model. Special attention is given to the practice-relevant areas of SCM, e.g., order-promising (plan), supplier-relation-management (source), postponement (make), and the ECR-concept (deliver).

Course Outcomes
On successful completion, students will be able to
- systematically explain the strategic relevance of enterprise-wide value creation processes.
- understand the most important tasks and problems in the SCM core process planning.
- systematize the elements and interrelationships in the CPFR model in a differentiated way.
- be familiar with the characteristics and peculiarities of contract logistics.
- understand the most important tasks and problems in the SCM core process procurement.
- explain central elements and characteristics of a procurement strategy.
- understand the most important tasks and problems in the SCM core process production.
- explain central elements and characteristics of a modern production strategy.
- understand the most important tasks and problems in the SCM core process distribution.
- explain central elements and characteristics of the so-called ECR concept.

Contents
1. Strategic Aspects of SCM
   1.1 Strategic Thinking and Action: General Information
   1.2 Competition Focus and SCM
   1.3 Competition Location and SCM
   1.4 Competition Rules and SCM
2. SCM Practice: Core Process Planning
   2.1 General Preliminary Considerations
   2.2 Collaborative Planning, Forecasting, and Replenishment
   2.3 Order Promoting
   2.4 Kanban
   2.5 Integration of X-PL Logistics Service Providers

3. SCM Practice: Core Process Procurement
   3.1 General Preliminary Considerations
   3.2 Production Synchronous Procurement
   3.3 Sourcing Concepts
   3.4 Supplier Relations Management

4. SCM Practice: Core Process Production
   4.1 Selected Aspects of the Problem Background
   4.2 Collaborative Engineering
   4.3 Postponement Strategies
   4.4 Value Added Partnership

5. SCM Practice: Core Process Distribution
   5.1 Basic Information on the Distribution Problem
   5.2 Efficient Consumer Response (ECR)
   5.3 Consignment Warehouse
### Literature

#### Compulsory Reading


#### Further Reading

### Study Format myStudies

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### Instructional Methods

- [ ] Learning Sprints®
- [x] Course Book
- [ ] Vodcast
- [x] Shortcast
- [x] Audio
- [x] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [ ] Live Tutorium/Course Feed
Study Format Distance Learning

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Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Financial Services Management
Module Code: DLBDSEFSM

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Module Coordinator
N.N. (Financial Services Management I) / N.N. (Financial Services Management II)

Contributing Courses to Module
- Financial Services Management I (DLBDSEFSM01)
- Financial Services Management II (DLBDSEFSM02)

Module Exam Type

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Weight of Module
see curriculum
## Module Contents

### Financial Services Management I
- Financial Markets and Financial Intermediaries
- Financial Intermediation in Germany
- Financial Services
- Debt Financing Through Financial Intermediaries
- Equity Financing Through Financial Intermediaries

### Financial Services Management II
- Fundamentals of the Monetary and Asset Situation
- Investment in Money
- Investment in Tangible Assets
- Investment Funds and Certificates
- Insurance Financial Services

## Learning Outcomes

### Financial Services Management I
On successful completion, students will be able to
- know the role of a financial service provider as a financier as well as how individual markets function in the financing sector.
- understand the basic relationships between the different financial services and their (supervisory) legal frameworks.
- evaluate the potential influence of the financial services sector on the real economy.
- familiarize themselves with the financing services offered both for external financing and for self-financing.
- assess the importance of financial services in the form of debt and equity financing in the short, medium, and long term.

### Financial Services Management II
On successful completion, students will be able to
- systematize the different possibilities for the investment of financial surpluses.
- with the help of knowledge gained regarding conflicts involved in making financial investments, apply different aspects of investment decision-making to financial instruments.
- assess the various forms of investment in order of their safety.
- analyze the various forms of investment in terms of risk and return.
- understand that investment funds, certificates, and derivatives are modern products of financial service providers, which bring high returns and sometimes high risk.

## Links to other Modules within the Study Program
This module is similar to other modules in the fields of Finance & Tax Accounting

## Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management fields
Financial Services Management I

Course Code: DLBDEFSM01

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Course Description

The course explains the origin and constitution of the financial market. As a result of the imperfection of the financial market, the necessity of financial intermediaries is theoretically derived, which leads to the thesis of disintermediation. Since the German financial market is determined by regulations and supervision, the legal framework is discussed. The financial services of banks and other specialized financial intermediaries are presented. The main forms of debt financing through financial intermediaries are presented as well as financing with equity capital.

Course Outcomes

On successful completion, students will be able to

- know the role of a financial service provider as a financier as well as how individual markets function in the financing sector.
- understand the basic relationships between the different financial services and their (supervisory) legal frameworks.
- evaluate the potential influence of the financial services sector on the real economy.
- familiarize themselves with the financing services offered both for external financing and for self-financing.
- assess the importance of financial services in the form of debt and equity financing in the short, medium, and long term.

Contents

1. Financial Markets and Financial Intermediaries
   1.1 Origin and Basic Problems of the Financial Market
   1.2 Appearances and Functions of Financial Intermediaries

2. Financial Intermediation
   2.1 The Banking System
   2.2 Asset Management Companies and Insurance Companies
   2.3 Regulations and Supervision

3. Financial Services
   3.1 Financing Needs
   3.2 The Range of Financial Services
4. Debt Financing Through Financial Intermediaries
   4.1 Types of Loans
   4.2 Lending and Collateralization
   4.3 Credit Substitutes

5. Equity Financing Through Financial Intermediaries
   5.1 Equity Financing Through Capital Participation and Venture Financing Companies
   5.2 Equity Capital Markets Issuance
   5.3 Disintermediation in Finance

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- [ ] Learning Sprints®
- ✔ Course Book
- [ ] Vodcast
- ✔ Shortcast
- ✔ Audio
- ✔ Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- ✔ Live Tutorium/Course Feed

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Financial Services Management II
Course Code: DLBDSFSM02

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Course Description
In this course, the different possibilities of investing financial surpluses are systematized. The conflicting relationship between the risks, returns, and liquidity of a financial investment are presented, and the different aspects of decision-making for investment in one of the financial instruments are shown. The various forms of investment (monetary values, tangible assets) are presented in the order of their security. The functions that insurance companies perform as financial service providers complete the picture. The different forms of life insurance and their role in old-age provision are presented.

Course Outcomes
On successful completion, students will be able to

- systematize the different possibilities for the investment of financial surpluses.
- with the help of knowledge gained regarding conflicts involved in making financial investments, apply different aspects of investment decision-making to financial instruments.
- assess the various forms of investment in order of their safety.
- analyze the various forms of investment in terms of risk and return.
- understand that investment funds, certificates, and derivatives are modern products of financial service providers, which bring high returns and sometimes high risk.

Contents
1. Basic Information on Investing Money and Assets
   1.1 Basic Concepts of Money and Asset Investment
   1.2 Framework Conditions for Decisions on Plants
   1.3 Investment Products
2. Investment in Money
   2.1 Investment in Accounts
   2.2 Savings Bonds
   2.3 Fixed-Interest Securities
3. Investment in Tangible Assets
   3.1 Shares
   3.2 Stock Exchange Trading
   3.3 Investment in Real Estate

4. Investment Funds and Certificates
   4.1 Mutual Funds
   4.2 Fund of Funds and Hedge Funds
   4.3 Derivatives

5. Insurance Financial Services
   5.1 Fundamentals of the Insurance Industry
   5.2 The Life Insurances

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
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- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed

www.iu.org
6. Semester
## Mathematics Basics

**Module Code:** DLBSEWMG_E

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### Module Coordinator

N.N. (Mathematics I) / Prof. Dr. Leonardo Riccardi (Mathematics II)

### Contributing Courses to Module

- Mathematics I (DLBCSM101)
- Mathematics II (DLBCSM201)

### Module Exam Type

#### Module Exam

- **Mathematics I**
  - Study Format “Distance Learning”: Exam, 90 Minutes
  - Study Format “myStudies”: Exam, 90 Minutes

- **Mathematics II**
  - Study Format “myStudies”: Exam, 90 Minutes
  - Study Format “Distance Learning”: Exam, 90 Minutes

### Weight of Module

see curriculum
Module Contents

Mathematics I
- Basic Definitions and Terms of Discrete Mathematics
- Sets and Propositional Logic
- Number Systems such as Decimal and Binary Systems
- Graphs and Mappings
- Selected Topics of Elementary Number Theory
- Cryptography

Mathematics II
- Selected Topics of Linear Algebra
- Selected Chapters on Graphs and Algorithms

Learning Outcomes

Mathematics I
On successful completion, students will be able to
- understand basic terms of discrete mathematics as well as describe them and distinguish them from each other.
- understand concepts of number theory and their application in IT and technology and be able to solve tasks independently by applying these concepts.

Mathematics II
On successful completion, students will be able to
- understand basic concepts of linear algebra, their interrelations, and their application in IT and technology and be able solve tasks independently using these concepts.
- understand and distinguish the basic concepts and important algorithms for graphs and trees from the field of discrete mathematics as well as their application in IT and technology.

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 IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management field.
Mathematics I
Course Code: DLBCSM101

Study Level | Language of Instruction | Contact Hours | CP | Admission Requirements
---|---|---|---|---
BA | English | 5 | none

Course Description
Many practical concepts in IT and technology are based on the findings of discrete mathematics. For an in-depth understanding of, for example, data structures, the construction of communication networks, or of solutions to algorithmic problems, a basic understanding of their mathematical background is necessary. This course therefore introduces discrete mathematical terms and concepts, with specific areas of number theory also taught.

Course Outcomes
On successful completion, students will be able to

- understand basic terms of discrete mathematics as well as describe them and distinguish them from each other.
- understand concepts of number theory and their application in IT and technology and be able to solve tasks independently by applying these concepts.

Contents
1. Mathematical Basics
   1.1 Basic Concepts
   1.2 Proof Techniques
   1.3 Finite Sums

2. Sets
   2.1 Properties and Calculation Rules for Sets
   2.2 Equivalence Relations

3. Propositional Logic
   3.1 Statements and Logical Connections
   3.2 Truth Tables
   3.3 Computational Rules of Propositional Logic
   3.4 Simplification of Expressions in Propositional Logic
4. Number Systems
   4.1 Decimal System
   4.2 Binary System
   4.3 Hexadecimal System

5. Mappings
   5.1 Mappings and Graphs
   5.2 Special Properties of Mappings

6. Basic Algebraic Structures
   6.1 Groups
   6.2 Rings
   6.3 Residual Class Rings

7. Prime Numbers
   7.1 Definition and Properties of Prime Numbers
   7.2 Prime Number Test

8. Modular Arithmetic
   8.1 The Euclidean Algorithm
   8.2 Fundamental Theorem of Arithmetic

9. Applications in Cryptography
   9.1 The Shift Cryptosystem
   9.2 Symmetric vs Asymmetric Cryptosystems
   9.3 The RSA Cryptosystem

Literature

Compulsory Reading

Further Reading
# Study Format Distance Learning

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed

www.iu.org
### Study Format myStudies

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Mathematics II
Course Code: DLBCSM201

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Course Description
This course continues the introduction to topics of discrete mathematics which began in the module "Mathematics Fundamentals I". In this course, the concepts of linear algebra are introduced and knowledge about graphs and algorithms for graphs is deepened. Typical questions of applied computer science are selected, and students are shown how they can be solved with graphs.

Course Outcomes
On successful completion, students will be able to

▪ understand basic concepts of linear algebra, their interrelations, and their application in IT and technology and be able solve tasks independently using these concepts.
▪ understand and distinguish the basic concepts and important algorithms for graphs and trees from the field of discrete mathematics as well as their application in IT and technology.

Contents
1. Introduction to Matrices
   1.1 Basic Concepts of Matrices
   1.2 Addition of Matrices
   1.3 Scalar Multiplication and Product

2. Inverting Matrices
   2.1 Multiplication of Matrices
   2.2 Properties of Matrix Multiplication
   2.3 Inverse Matrices

3. Linear Systems of Equations
   3.1 Gauss Algorithm
   3.2 Example Applications of the Gaussian Algorithm

4. Introduction to Graphs
   4.1 Undirected Graphs
   4.2 Further Properties of Graphs
   4.3 Adjacency Matrix
5. The Problem of the Shortest Routes
   5.1 Directional Graph or Digraph
   5.2 Weighted Graph
   5.3 Dijkstra’s Algorithm

6. The Königsberg Bridge Problem
   6.1 Routing in Graphs
   6.2 Eulerian Graph
   6.3 Hierholzer’s Algorithm
   6.4 The Postman Problem

7. A City Tour Where Each City is Visited Exactly Once.
   7.1 Special Graphs
   7.2 Hamiltonian Graph
   7.3 The Ore and Dirac Condition
   7.4 The Problem of the Traveling Salesman

8. Trees
   8.1 Properties of Trees
   8.2 Root Tree
   8.3 Spanning Tree
   8.4 Minimal Spanning Tree

Literature

Compulsory Reading

Further Reading
### Study Format myStudies

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### Instructional Methods

- Learning Sprints®
- Course Book
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## Study Format Distance Learning

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## Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
# Mathematics: Linear Algebra and Analysis

**Module Code:** DLBSEWMLAA_E

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**Module Coordinator**

Prof. Dr. Moustafa Nawito (Mathematics: Linear Algebra) / Prof. Dr. Robert Graf (Mathematics: Analysis)

**Contributing Courses to Module**

- Mathematics: Linear Algebra (DLBDSMFLA01)
- Mathematics: Analysis (DLBDSMFC01)

**Module Exam Type**

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**Weight of Module**

see curriculum
Module Contents

Mathematics: Linear Algebra
- Matrix Algebra
- Vector Spaces
- Linear and Affine Transformations
- Analytical Geometry
- Matrix Decomposition

Mathematics: Analysis
- Sequences and Series
- Functions and Reverse Functions
- Differential Calculus
- Integral Calculus

Learning Outcomes

Mathematics: Linear Algebra
On successful completion, students will be able to
- explain fundamental notions in the domain of linear equation systems.
- exemplify properties of vectors and vector spaces.
- summarize characteristics of linear and affine mappings.
- identify important relations in analytical geometry.
- utilize different methods for matrix decomposition.

Mathematics: Analysis
On successful completion, students will be able to
- summarize the basic concepts of analysis.
- illustrate the terms “consequences” and “series”.
- explain the concept of function and to understand the concept of the inverse function.
- explain basic statements of the differential and integral calculus.
- explain the relationship between differentiation and integration.
- master the derivation of higher-dimensional functions.

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 IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management field.
Mathematics: Linear Algebra

Course Code: DLBDSMFLA01

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Course Description
Linear algebra is a fundamental subject in mathematics. Its historical origin lies in the development of solution techniques for systems of linear equations arising from geometric problems. Numerous scientific and engineering applications can be solved using its methods. This course introduces the foundations of linear algebra and its basic notions like vectors and matrices. It then builds upon this foundation by introducing the derivation of solution techniques for problems in analytical geometry.

Course Outcomes
On successful completion, students will be able to

- explain fundamental notions in the domain of linear equation systems.
- exemplify properties of vectors and vector spaces.
- summarize characteristics of linear and affine mappings.
- identify important relations in analytical geometry.
- utilize different methods for matrix decomposition.

Contents
1. Fundamentals
   1.1 Systems of linear equations
   1.2 Matrices as compact representations of linear equations
   1.3 Matrix algebra
   1.4 Inverse and trace

2. Vector Spaces
   2.1 Definition
   2.2 Linear combination and linear dependance
   2.3 Base, span, and rank

3. Linear and affine mappings
   3.1 Matrix representations of linear mappings
   3.2 Image and kernel
   3.3 Affine spaces and sub-spaces
   3.4 Affine mappings
4. Analytical Geometry
   4.1 Norms
   4.2 Inner and dot product
   4.3 Orthogonal projections
   4.4 Rotations

5. Matrix Decomposition
   5.1 Determinant and trace
   5.2 Eigenvalues and eigenvectors
   5.3 Cholesky decomposition
   5.4 Eigenvalue decomposition and diagonalisation
   5.5 Singular value decomposition

Literature

Compulsory Reading

Further Reading
# Study Format Distance Learning

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## Instructional Methods

- [ ] Learning Sprints®
- [x] Course Book
- [ ] Vodcast
- [x] Shortcast
- [ ] Audio
- [x] Exam Template

- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [x] Live Tutorium/Course Feed
Mathematics: Analysis
Course Code: DLBDSMFC01

Study Level | Language of Instruction | Contact Hours | CP  | Admission Requirements
--- | --- | --- | --- | ---
BA | English | 5 | none |

Course Description
Analysis is one of the essential basic subjects of mathematics. Originally developed to be able to formulate and solve problems of classical mechanics mathematically, in its present rigorous form it has become indispensable in numerous applications in the natural sciences and technology. This module aims to introduce the basic hand tool of differential and integral calculus and to explain their mutual interrelations. In addition, the differential calculus is generalized to multidimensional spaces.

Course Outcomes
On successful completion, students will be able to
- summarize the basic concepts of analysis.
- illustrate the terms “consequences” and “series”.
- explain the concept of function and to understand the concept of the inverse function.
- explain basic statements of the differential and integral calculus.
- explain the relationship between differentiation and integration.
- master the derivation of higher-dimensional functions.

Contents
1. Sequences and series
   1.1 Sequences and series
   1.2 Convergence of infinite series
   1.3 power series
2. Functions and reverse functions
   2.1 Continuous functions
   2.2 Exponential and logarithm function
   2.3 Trigonometric functions and their inverse functions
3. Differential calculus
   3.1 Derivatives and higher derivatives
   3.2 curve discussion
   3.3 Rules (chain rule, product rule, quotient rule ...)
   3.4 Taylor Rows
4. Integral calculus
   4.1 The Riemann Integral
   4.2 Specific and indefinite integrals
   4.3 The fundamental theorem of differential and integral calculus
   4.4 Volumes and shells of rotary bodies
   4.5 Paths and lengths

5. Differential calculus in the Rn
   5.1 Partial Derivation
   5.2 Total Derivation
   5.3 Gradients of vector-valued functions and matrices

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- ☑ Learning Sprints®
- ☑ Course Book
- ☑ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
# Statistics Basics

**Module Code:** DLBSEWSG_E

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**Module Coordinator**
Prof. Dr. Stefan Stöckl (Statistics: Probability and Descriptive Statistics) / Dr. Stefan Stöckl (Statistics - Inferential Statistics)

**Contributing Courses to Module**
- Statistics: Probability and Descriptive Statistics (DLBDSSPDS01)
- Statistics - Inferential Statistics (DLBDSSIS01)

**Module Exam Type**

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www.iu.org
Module Contents

Statistics: Probability and Descriptive Statistics
- Probability
- Random Variables
- Joint Distributions
- Expectation and Variance
- Inequalities and Limit Theorems

Statistics - Inferential Statistics
- Point Estimation
- Uncertainties
- Bayesian Inference & Non-Parametric Techniques
- Statistical Testing
- Statistical Decision Theory

Learning Outcomes

Statistics: Probability and Descriptive Statistics
On successful completion, students will be able to
- define probability, random variable, and probability distribution.
- understand the concept of Bayesian statistics.
- grasp the definition of joint and marginal distributions.
- calculate expectation values and higher moments.
- comprehend important inequality equations and limit theorems.

Statistics - Inferential Statistics
On successful completion, students will be able to
- understand point estimation methods.
- apply maximum likelihood and ordinary least squares method to estimate parameters.
- comprehend the concept of statistical and systematic errors.
- employ error propagation methods.
- utilize Bayesian inference and non-parametric techniques.
- evaluate statistical tests.
- grasp the fundamentals of statistical decision theory.

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 IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management fields

www.iu.org
Statistics: Probability and Descriptive Statistics

Course Code: DLBDSSPDS01

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Course Description
Statistical description and analysis are the foundations for data-driven analysis and prediction methods. This course introduces the fundamentals, beginning with a formal definition of probabilities and introduction to the concepts underlying Bayesian statistics. Random variables and probability density distributions are then discussed, as well as the concept of joint and marginal distributions. The importance of various discrete and continuous distributions and their applications is stressed. Characterizing distributions is an important aspect of describing the behavior of probability distributions. Students are familiarized with expectation values, variance, and covariance. The concepts of algebraic and central moments and moment-generating functions complement the characterization of probability distributions. Finally, this course focuses on important inequalities and limit theorems such as the law of large numbers or the central limit theorem.

Course Outcomes
On successful completion, students will be able to
- define probability, random variable, and probability distribution.
- understand the concept of Bayesian statistics.
- grasp the definition of joint and marginal distributions.
- calculate expectation values and higher moments.
- comprehend important inequality equations and limit theorems.

Contents
1. Probability
   1.1 Definitions
   1.2 Independent events
   1.3 Conditional probability
   1.4 Bayesian statistics

2. Random Variables
   2.1 Random Variables
   2.2 Distribution functions and probability mass functions
   2.3 Important discrete probability distributions
   2.4 Important continuous probability distributions
3. Joint Distributions
   3.1 Joint distributions
   3.2 Marginal distributions
   3.3 Independent random variables
   3.4 Conditional distributions

4. Expectation and Variance
   4.1 Expectation of a random variable, conditional expectations
   4.2 Variance and covariance
   4.3 Expectations and variances of important probability distributions
   4.4 Algebraic and central moments
   4.5 Moment-generating functions

5. Inequalities and Limit Theorems
   5.1 Probability inequalities
   5.2 Inequalities for expectations
   5.3 The law of large numbers
   5.4 Central limit theorem

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed

www.iu.org
### Study Format myStudies

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
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- ☑ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
Statistics - Inferential Statistics

Course Code: DLBDSSIS01

Study Level: BA
Language of Instruction: English
Contact Hours: CP 5
Admission Requirements: DLBDSSPDS01

Course Description
Statistical analysis and understanding are the foundations of data-driven methods and machine learning approaches. This course gives a thorough introduction to point estimators and discusses various techniques to estimate and optimize parameters. Special focus is given to a detailed discussion of both statistical and systematic uncertainties as well as propagation of uncertainties. Bayesian statistics is fundamental to data-driven approaches, and this course takes a close look at Bayesian techniques such as Bayesian parameter estimation and prior probability functions. Furthermore, this course gives an in-depth overview of statistical testing and decision theory, focusing on aspects such as A/B testing, hypothesis testing, p-values, and multiple testing which are fundamental to statistical analysis approaches in a broad range of practical applications.

Course Outcomes
On successful completion, students will be able to
- understand point estimation methods.
- apply maximum likelihood and ordinary least squares method to estimate parameters.
- comprehend the concept of statistical and systematic errors.
- employ error propagation methods.
- utilize Bayesian inference and non-parametric techniques.
- evaluate statistical tests.
- grasp the fundamentals of statistical decision theory.

Contents
1. Point Estimation
   1.1 Method of moments
   1.2 Sufficient statistics
   1.3 Maximum likelihood
   1.4 Ordinary least squares
   1.5 Resampling techniques
2. Uncertainties
   2.1 Statistical and systematic uncertainties
   2.2 Propagation of uncertainties
3. Bayesian Inference & Non-parametric Techniques
   3.1 Bayesian parameter estimation
   3.2 Prior probability functions
   3.3 Parzen windows
   3.4 K-nearest-neighbours

4. Statistical Testing
   4.1 A/B testing
   4.2 Hypothesis tests & test statistics
   4.3 P-values & confidence intervals
   4.4 Multiple testing

5. Statistical Decision Theory
   5.1 The risk function
   5.2 Maximum likelihood, Minimax, and Bayes
   5.3 Admissibility and Stein's paradox

Literature

Compulsory Reading

Further Reading
## Study Format Distance Learning

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Data Science and object oriented programming with Python
Module Code: DLBSEWDSPP_E

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<tr>
<td>Prof. Dr. Thomas Zöller (Introduction to Data Science) / Prof. Dr. Max Pumperla (Object oriented and functional programming in Python)</td>
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<td>▪ Object oriented and functional programming in Python (DLBDSOOFPP01)</td>
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Module Contents

**Introduction to Data Science**
- Introduction to Data Science
- Data
- Data Science in Business
- Statistics
- Machine Learning

**Object oriented and functional programming in Python**

This course introduces students to the advanced programming concepts of object orientation and functional programming and how they are realized in the Python programming language.

Learning Outcomes

**Introduction to Data Science**
On successful completion, students will be able to
- define data science and its relation to other fields.
- comprehend data science activities.
- recognize the origins of data and the challenges of working with data.
- understand how data science methods are integrated into business settings.
- grasp fundamental statistical concepts.
- appreciate the importance of machine learning in data science.

**Object oriented and functional programming in Python**
On successful completion, students will be able to
- explain basic notions in object-oriented programming such as functions and classes.
- understand object-oriented programming concepts and their relation to software design and engineering.
- describe advanced function concepts in Python.
- recognize important ideas from functional programming.
- recall important libraries for functional programming in Python.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology fields
Introduction to Data Science
Course Code: DLBDSIDS01

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Course Description
Data science emerged as a multi-disciplinary field aimed at creating value from data. This course starts with an overview of data science and related fields and then defines data types and sources. Special focus is put on the assessment of data quality and electronic data processing. Use of data-driven methods has become vital for businesses, and this course outlines how data-driven approaches can be integrated within a business context and how operational decisions can be made using data-driven methods. Finally, this course highlights the importance of statistics and machine learning in the field of data science and gives an overview of relevant methods and approaches.

Course Outcomes
On successful completion, students will be able to
- define data science and its relation to other fields.
- comprehend data science activities.
- recognize the origins of data and the challenges of working with data.
- understand how data science methods are integrated into business settings.
- grasp fundamental statistical concepts.
- appreciate the importance of machine learning in data science.

Contents
1. Introduction to Data Science
   1.1 Definition of the term „data science”
   1.2 Data science and related fields
   1.3 Data science activities

2. Data
   2.1 Data types and data sources
   2.2 The 5Vs of data
   2.3 Data curation and data quality
   2.4 Data engineering
### 3. Data Science in Business

3.1 Identification of use cases
3.2 Performance evaluation
3.3 Data-driven operational decisions
3.4 Cognitive biases

### 4. Statistics

4.1 Importance of statistics for data science
4.2 Important statistical concepts

### 5. Machine Learning

5.1 Role of machine learning in data science
5.2 Overview of machine learning approaches

---

**Literature**

**Compulsory Reading**

**Further Reading**

# Study Format Distance Learning

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## Information about the examination

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| Type of Exam | Oral Assignment |

## Student Workload

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Object oriented and functional programming in Python

Course Code: DLBDSOOFPP01

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Course Description

This course builds upon basic knowledge of Python programming (Introduction to Programming with Python, DLBDSIPWP) and is concerned with the exposition of advanced Python programming concepts. To this end, important notions of object-oriented programming like classes and objects and pertaining design principles are outlined. Starting from an in-depth discussion of advanced features of Python functions, functional programming concepts and their implementation in Python are conveyed.

Course Outcomes

On successful completion, students will be able to

- explain basic notions in object-oriented programming such as functions and classes.
- understand object-oriented programming concepts and their relation to software design and engineering.
- describe advanced function concepts in Python.
- recognize important ideas from functional programming.
- recall important libraries for functional programming in Python.

Contents

- This course provides students with a thorough introduction to important notions and concepts from the domain of object-oriented programming such as classes, objects, abstraction, encapsulation, inheritance, polymorphism, composition, and delegation. Additionally, the functional programming paradigm and pertaining ideas like functions as first class objects, decorators, pure functions, immutability and higher order functions are conveyed. Pursuant to the portfolio course type, the aforementioned concepts and ideas are explored by hands-on programming projects.
Literature

Compulsory Reading

Further Reading

## Study Format Distance Learning

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### Student Workload

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
# Internet of Things and Embedded Systems

**Module Code:** DLBSEWITES_E

<table>
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## Semester / Term
- see curriculum

## Duration
- Minimum 1 semester

## Regularly offered in
- WiSe/SoSe

## Language of Instruction
- English

### Module Coordinator
Prof. Dr. Marian Benner-Wickner (Introduction to the Internet of Things) / N.N. (Embedded Systems)

### Contributing Courses to Module
- Introduction to the Internet of Things (DLBINGEIT01_E)
- Embedded Systems (DLBROES01_E)

### Module Exam Type

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### Weight of Module
- see curriculum
Module Contents

Introduction to the Internet of Things
- Internet of Things Fundamentals
- Social and Economic Significance
- Communication Standards and Technologies
- Data Storage and Processing
- Design and Development
- Applicability

Embedded Systems
- Embedded Systems Architecture
- Embedded Hardware
- Embedded Software
- Distributed Systems and IoT Architecture
- Embedded Operating Systems

Learning Outcomes

Introduction to the Internet of Things
On successful completion, students will be able to
- grasp the distinctive features of Internet of Things (IoT) and IoT systems.
- understand the social and economic importance of Internet of Things.
- identify the most important standards for communication between IoT devices.
- differentiate between various techniques for storing and processing data in IoT systems.
- identify different architectures and technologies for structuring IoT systems.
- recognize challenges of data protection and data security in IoT systems.

Embedded Systems
On successful completion, students will be able to
- understand the architecture of embedded systems.
- understand real-time embedded systems.
- design the main architecture of embedded systems for robotics, automation and IoT infrastructure.

Links to other Modules within the Study Program
This module is similar to other modules in the fields of Computer Science & Software and Engineering

Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the IT & Technology fields
Introduction to the Internet of Things

Course Code: DLBINGEIT01_E

Course Description
The aim of this course is to give students an insight into technical and theoretical basics of the Internet of Things (IoT) and its fields of application. In addition to the general structure of IoT systems and the technology standards used in them, students are also taught the importance of Internet of Things for economy and society. Furthermore, this course demonstrates how data is exchanged, stored and processed in IoT.

Course Outcomes
On successful completion, students will be able to
- grasp the distinctive features of Internet of Things (IoT) and IoT systems.
- understand the social and economic importance of Internet of Things.
- identify the most important standards for communication between IoT devices.
- differentiate between various techniques for storing and processing data in IoT systems.
- identify different architectures and technologies for structuring IoT systems.
- recognize challenges of data protection and data security in IoT systems.

Contents
1. Internet of Things Fundamentals
   1.1 The Internet of Things - Basics and Motivation
   1.2 Evolution of the Internet - Web 1.0 to Web 4.0

2. Social and Economic Significance
   2.1 Innovations for Consumers and Industry
   2.2 Implications on People and the World of Work
   2.3 Data Protection and Data Security

3. Communication Standards and Technologies
   3.1 Network Topologies
   3.2 Network Protocols
   3.3 Technologies
4. Data Storage and Processing
   4.1 Networked Storage with Linked Data and RDF(S)
   4.2 Analysis of Networked Data using a Semantic Reasoner
   4.3 Processing of Data Streams with Complex Event Processing
   4.4 Operation and Analysis of Large Data Clusters using NoSQL and MapReduce

5. Design and Development
   5.1 Software Engineering for Distributed and Embedded Systems
   5.2 Architecture Styles and Patterns of Distributed Systems
   5.3 Platforms: Microcontrollers, Monoboard Computers, One-Chip Systems

6. Applicability
   6.1 Smart Home / Smart Living
   6.2 Ambient Assisted Living
   6.3 Smart Energy / Smart Grid
   6.4 Smart Factory
   6.5 Smart Logistics

Literature

Compulsory Reading

Further Reading
# Study Format Distance Learning

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## Instructional Methods

- ☐ Learning Sprints®
- ✔ Course Book
- ☐ Vodcast
- ✔ Shortcast
- ✔ Audio
- ✔ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ✔ Live Tutorium/Course Feed
### Study Format myStudies

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### Student Workload

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Embedded Systems
Course Code: DLBROES01_E

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Course Description
Embedded systems are required to make functional engineering systems operational. Through embedding microprocessor-based systems capable of networking, data exchange and processing, the functionality of products and systems can be enhanced in terms of features, precision, accuracy, dynamic properties, and intelligence. In this sense, an embedded system is the place where everything begins. This course provides the basics on embedded systems, by focusing on the architectural patterns of modern systems and platforms. The embedded hardware and software aspects are addressed. An emphasis of this course is given to connectivity and networking aspects to build distributed systems for the internet of things and the industrial internet of things (with the final purpose of conceptualizing cyber-physical systems). The course closes with an overview on existing common embedded operating systems.

Course Outcomes
On successful completion, students will be able to
- understand the architecture of embedded systems.
- understand real-time embedded systems.
- design the main architecture of embedded systems for robotics, automation and IoT infrastructure.

Contents
1. Introduction
   1.1 Embedded Systems Design
   1.2 Embedded Systems Architecture
   1.3 Embedded Systems Models
   1.4 Standards, Compilers and Programming Languages

2. Embedded Hardware
   2.1 Schematics
   2.2 Basic Components
   2.3 Embedded Processors
   2.4 Board Memory
   2.5 Board I/O
   2.6 Buses
3. Embedded Software
   3.1 Device Drivers
   3.2 Scheduling Basics
   3.3 State Machines
   3.4 Interrupts
   3.5 Watchdogs
   3.6 Embedded Operating Systems
   3.7 Middleware

4. Distributed Systems and IoT Architecture
   4.1 Network Interfaces (Ethernet, WiFi, 6LoWPAN, Bluetooth...)
   4.2 The Internet Protocol
   4.3 Transport Layer Security
   4.4 Application Protocols (Message protocols, REST)

5. Embedded Operating Systems
   5.1 Task Management
   5.2 Scheduler
   5.3 Synchronization
   5.4 System Resource Separation
   5.5 Examples of Embedded Operating Systems

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Student Workload

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
## Robotics and Production Engineering

**Module Code:** DLBSEWRI_E

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**Module Coordinator**

Prof. Dr. Matthias Eifler (Introduction to Robotics) / Prof. Dr. Mario Boßlau (Production Engineering)

**Contributing Courses to Module**

- Introduction to Robotics (DLBROIR01_E)
- Production Engineering (DLBDSEAR01)

**Module Exam Type**

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**Weight of Module**

see curriculum
Module Contents

Introduction to Robotics
- Introduction to Robotics
- Trends
- Industrial Robots
- Mobile Robots
- Applications

Production Engineering
- Introduction to Manufacturing Technology
- Main Production Groups According to DIN 8580
- Additive Manufacturing Processes
- Rapid Prototyping
- Rapid Tooling
- Direct/Rapid Manufacturing
- Cyber-Physical Production Plants

Learning Outcomes

Introduction to Robotics
On successful completion, students will be able to
- name important developments in the field of robotics.
- understand the mechanical structure and characteristics of robots.
- name characteristics and challenges of industrial robots.
- name characteristics and challenges of mobile robots.
- understand the role of robots in applications.
- name and understand current trends in the field of robotics.

Production Engineering
On successful completion, students will be able to
- understand the basic concepts and interrelationships of production engineering.
- understand current changes in manufacturing technology due to technologies such as additive manufacturing and megatrends such as cyber physical systems.
- assign different manufacturing processes to the main manufacturing groups according to DIN 8580.
- understand the basic principle of additive manufacturing processes.
- distinguish between different additive manufacturing processes.
- understand the terms Rapid Prototyping, Rapid Tooling, and Direct Manufacturing and name individual processes and application examples.
- understand the elements and properties of cyber-physical production plants.
<table>
<thead>
<tr>
<th>Links to other Modules within the Study Program</th>
<th>Links to other Study Programs of IU International University of Applied Sciences</th>
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Introduction to Robotics

Course Code: DLBROIR01_E

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Course Description
Robotics is experiencing very interesting developments, which experts describe as being a transition to a new generation of robots. We have moved from the “4Ds” of Robotics 1.0 (dull, dirty, dumb, dangerous) to the “4Ss” of Robotics 2.0 (smarter, safer, sensors, simple), but we still need to proceed further to the “4Ms” of Robotics 3.0 (multitasking, emotive, morphing, multiagent). This course, thus, provides the required background to understand the main development of robotics looking at industrial as well as at mobile robots, their main characteristics, issues, challenges, applications, and development trends.

Course Outcomes
On successful completion, students will be able to

- name important developments in the field of robotics.
- understand the mechanical structure and characteristics of robots.
- name characteristics and challenges of industrial robots.
- name characteristics and challenges of mobile robots.
- understand the role of robots in applications.
- name and understand current trends in the field of robotics.

Contents
1. What is Robotics?
   1.1 Basics and Definitions
   1.2 History and Cultural Influence
   1.3 Challenges and Trends (from Robotics 1.0 to Robotics 3.0)

2. Robots
   2.1 Mechanical Structure
   2.2 Kinematic Chains
   2.3 Market Overview
3. Industrial Robots
   3.1 Components of Industrial Robot Systems
   3.2 Characteristics
   3.3 Common Industrial Robots
   3.4 Applications
   3.5 Trends

4. Mobile Robots
   4.1 Components of Mobile Robot Systems
   4.2 Characteristics
   4.3 Common Mobile Robots
   4.4 Applications
   4.5 Trends

5. Applications
   5.1 Industrial Robots
   5.2 Healthcare
   5.3 Agriculture or Field Robotics
   5.4 Space and Defense
   5.5 Warehouse and Logistics
   5.6 Construction
   5.7 Wearables
   5.8 Social Robots

Literature

Compulsory Reading

Further Reading
- Siciliano, B., & Khatib, O. (Eds.). (2016). Springer handbook of robotics. Springer
### Study Format Distance Learning

<table>
<thead>
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### Information about the examination

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| Type of Exam                      | Exam or Written Assessment: Written Assignment, 90 Minutes |

### Student Workload

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<th>Tutorial</th>
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<th>Practical Experience</th>
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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed

[www.iu.org](http://www.iu.org)
### Study Format myStudies

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### Student Workload

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### Instructional Methods

- Learning Sprints®
- Review Book
- Course Book
- Creative Lab
- Vodcast
- Guideline
- Shortcast
- Live Tutorium/Course Feed
- Audio
- Exam Template
Production Engineering
Course Code: DLBDSEAR01

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Course Description
The aim of the course is to provide students with an overview of the processes that have influenced and still influence production processes through technological developments under the generic term Industry 4.0, based on traditional, standardized manufacturing techniques. These include, in particular, technological advances in additive manufacturing processes that enable applications such as rapid prototyping, rapid tooling, and direct manufacturing. Finally, the course deals with the consequences of the digitalization and networking of production facilities and their elements in the sense of a cyber-physical system.

Course Outcomes
On successful completion, students will be able to

- understand the basic concepts and interrelationships of production engineering.
- understand current changes in manufacturing technology due to technologies such as additive manufacturing and megatrends such as cyber physical systems.
- assign different manufacturing processes to the main manufacturing groups according to DIN 8580.
- understand the basic principle of additive manufacturing processes.
- distinguish between different additive manufacturing processes.
- understand the terms Rapid Prototyping, Rapid Tooling, and Direct Manufacturing and name individual processes and application examples.
- understand the elements and properties of cyber-physical production plants.

Contents
1. Introduction to Manufacturing Technology
   1.1 Basic Terms and Contexts in Manufacturing Theory
   1.2 Historical Development of Production
   1.3 The Discussion About the Long Tail
2. Main Production Groups According to DIN 8580
   2.1 Archetypes
   2.2 Reshaping
   2.3 Cutting (Cutting, Machining, Ablation)
   2.4 Joining
   2.5 Coating
   2.6 Substance Property Changes

3. Additive Manufacturing Processes
   3.1 Basic Principles and Legal Aspects
   3.2 Stereolithography (STL)
   3.3 Selective Laser Sintering and Selective Beam Melting With Laser or Electron Beam
   3.4 Fused Deposition Modeling (FDM)
   3.5 Multi-Jet Modeling (MJM) and Poly-Jet Process (PJM)
   3.6 3D Printing Process (3DP)
   3.7 Laminating Processes
   3.8 Mask Sintering

4. Rapid Prototyping
   4.1 Definition
   4.2 Strategic and Operational Aspects
   4.3 Application Areas and Examples

5. Rapid Tooling
   5.1 Definition, Strategic, and Operational Aspects
   5.2 Indirect and Direct Procedures

6. Direct/Rapid Manufacturing
   6.1 Potentials and Requirements for Procedures
   6.2 Implementation, Application Areas, and Examples

7. Cyber-Physical Production Plants
   7.1 Derivation of the Terms Industry 4.0 and Cyber-Physical Systems
   7.2 Megatrend Cyber Physical Systems (CPS)
   7.3 Definition Cyber-Physical Production Plant
   7.4 Effects on Planning and Operation of Production Facilities
   7.5 Dynamic Reconfiguration and Migration of Production Facilities
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## Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
### Study Format Distance Learning

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### Instructional Methods

- [ ] Learning Sprints®
- [x] Course Book
- [ ] Vodcast
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- [x] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [x] Live Tutorium/Course Feed
# International Management and Leadership

**Module Code:** DLBSEWIML_E

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**Module Coordinator**

Prof. Dr. Jürgen Matthias Seeler (International Management) / N.N. (Leadership 4.0)

**Contributing Courses to Module**

- International Management (BWINT01)
- Leadership 4.0 (DLBWPLS01_E)

**Module Exam Type**

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**Weight of Module**

see curriculum
Module Contents

International Management

▪ Globalization and the internationalization of business
▪ Assessment of political, legal, economic, and cultural Contexts
▪ Strategy in international business
▪ Organization in international business
▪ Marketing in international business
▪ Human resource management in international business

Leadership 4.0

▪ Conventional understanding of leadership
▪ Management tools
▪ Leadership versus management
▪ Integral concept of humankind as future-oriented model
▪ Characteristics and competencies of leaders
▪ Leadership models
▪ Agile Leadership instruments
Learning Outcomes

International Management

On successful completion, students will be able to

▪ recognize and explain the cultural, social, economic, historical, and political differences that affect strategic decision making on an international/global scale.
▪ gather specific information and conduct reliable assessments of the opportunities and risks related to business activities in different geographical market regions and specific national markets.
▪ describe the impact of culture on international business activities.
▪ identify different options for market entry and market development and participate in strategic planning activities that address these issues.
▪ design and evaluate different organizational structures for international businesses and design measures to optimize organizational structures for international operations.
▪ design, evaluate, and optimize human resource management practices for global and multinational companies.
▪ explain options for international marketing and select an appropriate marketing mix relative to specific products/services and the target market.
▪ identify and manage challenges associated with operating in an international/global business environment, such as the procurement and coordination of resources and human resource management.
▪ develop business plans that implement specific organizational, marketing, and distribution strategies in selected regions/countries.

Leadership 4.0

On successful completion, students will be able to

▪ understand the classical theories of leadership and new leadership models.
▪ distinguish between the terms leadership and management.
▪ reflect on the understanding of successful leadership models against the background of economic changes.
▪ develop an understanding of the need for alternative forms of organizational directing.
▪ implement appropriate leadership methods according to a company's level of complexity.
▪ draw upon a sound theoretical understanding that they can practice in applied research.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programs in the Business & Management field
International Management

Course Code: BWINT01

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**Course Description**

Globalization presents multiple opportunities and challenges to product and service industries. Many companies previously engaged in local markets must consider global trends and international markets, both on the demand and on the supply side. With this, comes new opportunities to market products and services. At the same time, complexity in daily business increases and managers have to face ambiguities and frequently changing contexts. With more competition, more diverse markets, and cultural, political, and legal challenges abroad, it has become more difficult to manage a company efficiently. All these factors call for managers to adopt a global mindset and sufficient cultural sensitivity. The course is designed to cover the economic, organizational, and cultural underpinnings that students need to grasp in order to better understand the managerial challenges that global organizations of all types and sizes have to cope with. Participants of this course will be provided with empirical knowledge and first-hand experiences of international management. Through multiple case studies within the course book, online lectures, and tutorials, students will develop a detailed understanding of the strategies and operational patterns necessary to successfully operate in international markets.
Course Outcomes
On successful completion, students will be able to

- recognize and explain the cultural, social, economic, historical, and political differences that affect strategic decision making on an international/global scale.
- gather specific information and conduct reliable assessments of the opportunities and risks related to business activities in different geographical market regions and specific national markets.
- describe the impact of culture on international business activities.
- identify different options for market entry and market development and participate in strategic planning activities that address these issues.
- design and evaluate different organizational structures for international businesses and design measures to optimize organizational structures for international operations.
- design, evaluate, and optimize human resource management practices for global and multinational companies.
- explain options for international marketing and select an appropriate marketing mix relative to specific products/services and the target market.
- identify and manage challenges associated with operating in an international/global business environment, such as the procurement and coordination of resources and human resource management.
- develop business plans that implement specific organizational, marketing, and distribution strategies in selected regions/countries.

Contents
1. Introduction to International Management
   1.1 What is Globalization?
   1.2 Facts about Globalization and the Global Economy
   1.3 Theoretical Explanations for Globalization

2. The International Company and its Environment
   2.1 International Companies and their Operations
   2.2 Operational Patterns in International Markets
   2.3 Assessment of the Environment for Internalization

3. Culture and International Business
   3.1 A Generic Perspective on Culture
   3.2 Organizational Culture
   3.3 Cultural Diversity and the Contemporary Manager
4. Strategy Development in International Business
   4.1 Strategy in Globalized Business Operations
   4.2 Strategy Concepts and Strategic Options
   4.3 Managing Strategy

5. International Human Resource Management
   5.1 Characteristics of International Human Resource Management
   5.2 The Global Manager
   5.3 Instruments in International Human Resource Management

6. Organization in International Business
   6.1 Traditional Perspectives on Business Organization
   6.2 Modern Views on Business Organization
   6.3 Coordination of Intra-Organization Collaboration

7. International Marketing
   7.1 Marketing in International Business
   7.2 Strategic Choices in International Marketing
   7.3 Marketing Mix Choices in International Marketing

Literature

Compulsory Reading

Further Reading
Study Format Distance Learning

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Instructional Methods

☐ Learning Sprints®  ☐ Review Book
☒ Course Book        ☐ Creative Lab
☐ Vodcast           ☐ Guideline
☒ Shortcast          ☐ Live Tutorium/Course Feed
☒ Audio              ☐
☒ Exam Template
Leadership 4.0
Course Code: DLBWPLS01_E

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Course Description
Today, competitiveness depends more than ever on continuous innovation. This puts new demands on the management of companies. The task of successful leaders in innovation and business is no longer to offer direction and solutions, but to create a framework in which others develop innovations. This change, which is currently taking place with full force in companies, requires further developments on classic leadership concepts and its principles. Against the background of digital change and the advance of artificial intelligence, established business models are constantly being put to the test. On the one hand, it is important to work on several projects simultaneously and to adapt flexibly to changing conditions at any time; on the other hand, employees want to be integrated into the work process in a different way. Consideration and flexibility for their personal and family situation play an increasing role. Innovation and business leaders can only meet all these diverse challenges with Leadership by inspiring others to think ahead and act inter-divisionally, in other words, to be visionary. This course tries to convey knowledge, understanding and tools for this challenging field of work.

Course Outcomes
On successful completion, students will be able to

- understand the classical theories of leadership and new leadership models.
- distinguish between the terms leadership and management.
- reflect on the understanding of successful leadership models against the background of economic changes.
- develop an understanding of the need for alternative forms of organizational directing.
- implement appropriate leadership methods according to a company’s level of complexity.
- draw upon a sound theoretical understanding that they can practice in applied research.

Contents
1. Basics of the Leadership Concept
   1.1 Definition of the Leadership Concept and Leadership Actions
   1.2 Development of the Understanding of Leadership
   1.3 The Role of Communication in Leadership
   1.4 New Challenges for Leadership
2. Leadership Versus Management
   2.1 Distinctions between these Concepts
   2.2 Relevance of Leadership in the Context of Technological Change
   2.3 New Forms of Work as a Challenge for Leadership 4.0

3. Organizational Prerequisites for Successful Leadership
   3.1 Launching Corporate Governance Initiatives
   3.2 From Process to Project Management
   3.3 Managing Limited Resources

4. Personal Factors for Successful Leadership
   4.1 Personal Characteristics
   4.2 Technological Know-how
   4.3 Policy and Compliance

5. Management Tools
   5.1 Definition, Differentiation and Challenges
   5.2 Use of Direct Management Tools
   5.3 Use of Indirect Management Tools

6. Leadership 4.0 Models
   6.1 Transformational Leadership
   6.2 Leadership as an Agile Role
   6.3 Authentic Leadership

7. Leadership 4.0 Case Studies
   7.1 Allsafe Jungfalk
   7.2 Automattic
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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Study Format Distance Learning

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**Student Workload**

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**Instructional Methods**

- ☐ Learning Sprints®
- ☒ Course Book
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- ☒ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☒ Live Tutorium/Course Feed
# International Marketing and Branding

**Module Code:** DLBDSEIMB

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**Module Coordinator**

Caterina Fox (International Marketing) / N.N. (International Brand Management)

**Contributing Courses to Module**

- International Marketing (DLBDSEIMB01)
- International Brand Management (DLBDSEIMB02)

**Module Exam Type**

**Module Exam**

- International Marketing
  - Study Format “myStudies”: Exam, 90 Minutes
  - Study Format “Distance Learning”: Exam, 90 Minutes

- International Brand Management
  - Study Format “myStudies”: Exam, 90 Minutes
  - Study Format “Distance Learning”: Module Exam (50)

**Weight of Module**

see curriculum

www.iu.org
Module Contents

International Marketing
- International marketing strategy
- Cultural differences and their significance for marketing
- International marketing mix (product, price, promotion, and distribution decisions in an international environment)
- International market research and consumer behavior
- Ethical aspects in international marketing
- International marketing controlling and six sigma

International Brand Management
- Basics of brand management
- Framework conditions for brands in international markets
- Strategies and concepts of international brands
- Brand architectures and brand extension options
- Brand management and communication
- Brand management according to the stakeholder concept
- Brand control and protection

Learning Outcomes

International Marketing
On successful completion, students will be able to
- understand basic aspects of international strategic marketing.
- analyze cultural differences and their impact on international marketing.
- apply selected concepts of the international marketing mix.
- describe the possibilities of international market research and its influence on consumer behavior.
- recognize the necessity of international brand controlling and quality management.
- reproduce theoretical knowledge using case studies.

International Brand Management
On successful completion, students will be able to
- recognize the significance of a brand and the general conditions under which brands operate, as well as the associated tasks of brand management.
- describe the components of a brand and its management.
- explain the positioning of brands on regional, national and international markets.
- understand the role of brand evaluation and compare the most common measurement techniques.
- give an overview of the importance of trademark protection and suggest strategies for preventing counterfeiting.
- conceive of brand strategies and measures for the avoidance or occurrence of brand crises.
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International Marketing
Course Code: DLBDSEIMB01

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Course Description
Students are taught the necessity for strategic marketing in an international context. They will learn about essential cultural differences and their influences on international marketing management. The basic decisions, standardizations, and adaptations in international marketing are experienced by the students on the basis of different concepts in the international marketing mix. The necessity of international market research, strategic planning, and control are taught to the students, along with the ethical aspects in international marketing. The students analyze current topics in international marketing management and reflect on them in connection with the concepts they have learned in this course.

Course Outcomes
On successful completion, students will be able to

- understand basic aspects of international strategic marketing.
- analyze cultural differences and their impact on international marketing.
- apply selected concepts of the international marketing mix.
- describe the possibilities of international market research and its influence on consumer behavior.
- recognize the necessity of international brand controlling and quality management.
- reproduce theoretical knowledge using case studies.

Contents
1. Strategic International Marketing
   1.1 Internationalization
   1.2 Theoretical Foundations of International Market Entry Strategies
   1.3 Forms of International Market Entry

2. Cultural Differences as an Aspect of International Marketing
   2.1 Overview of Culture
   2.2 Cultural Model Based on Hofstede
   2.3 Cultural Model Based on Trompenaars
3. Case Studies in International Market Entry and Marketing Strategies
   3.1 Case Study: Nivea in South Korea
   3.2 Case Study: Bosch and Siemens Hausgeräte GmbH in China
   3.3 Case Study: Siemens Mobile in China
   3.4 Case Study: Siemens in China

4. International Product Management and Product Development
   4.1 Goals of International Product Management
   4.2 Framework Conditions for International Product Management
   4.3 International Product Decisions
   4.4 International Product Development

5. Exchange Rate Fluctuations and International Price Calculation
   5.1 Tasks and Objectives of International Price Management
   5.2 Factors Influencing International Price Management
   5.3 Instruments of International Price Management

6. International Communication and International Sales Policy
   6.1 International Communication Management
   6.2 International Sales Management

7. International Marketing and Ethics
   7.1 Overview of International Marketing and Ethics
   7.2 Business Ethics in International Companies
   7.3 Case Study: Nestlé

8. Applied Market Research and Its Influence on Consumer Behavior
   8.1 Scope of International Market Research
   8.2 Requirements for International Market Research Information
   8.3 International Secondary Research
   8.4 International Primary Research

9. Monitoring and Control in International Marketing
   9.1 Controlling in International Management

10. Six Sigma, Brand Management, and Rebranding
   10.1 Six Sigma: Basics, Definitions, and Processes
   10.2 Brand Management
   10.3 Rebranding
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Study Format myStudies

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Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
### Study Format Distance Learning

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[www.iu.org](http://www.iu.org)
International Brand Management

Course Code: DLBDSEIMB02

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Course Description
The aim of this course is to deepen and expand the knowledge acquired in the introductory elective course International Marketing. The value of a brand is a decisive competitive advantage for companies in international business. Brands create long-term and profitable customer relationships. Brands are therefore valuable assets for companies and organizations. Students learn the basics of brand management before moving on to the concepts and success factors of international brand management. Students also become familiar with the structure of brand architectures and the possibilities of brand extensions. The fact that different stakeholder groups must be taken into account in brand management is communicated to the students on the basis of the stakeholder concept. In addition, the students get to know the various methods for measuring brand value and brand controlling. The aspects of trademark protection that are particularly important in an international environment will be dealt with conclusively.

Course Outcomes
On successful completion, students will be able to

▪ recognize the significance of a brand and the general conditions under which brands operate, as well as the associated tasks of brand management.
▪ describe the components of a brand and its management.
▪ explain the positioning of brands on regional, national and international markets.
▪ understand the role of brand evaluation and compare the most common measurement techniques.
▪ give an overview of the importance of trademark protection and suggest strategies for preventing counterfeiting.
▪ conceive of brand strategies and measures for the avoidance or occurrence of brand crises.

Contents
1. Basics of Brand Management
   1.1 Brand Significance and Brand Understanding
   1.2 Market Conditions
   1.3 Tasks and Goals of Brand Management
2. Brand Identity, Brand Positioning, and Brand Personality
   2.1 Brand Identity as the Basis of Brand Management
   2.2 Brand Positioning
   2.3 Brand Image
   2.4 Brand Personality

3. Brand Strategies
   3.1 The Challenges for Brand Strategies
   3.2 Brand Strategies for New Products
   3.3 Trademark Licensing

4. International Branding
   4.1 Importance of Branding for International Companies
   4.2 Brand Concepts for International Brands
   4.3 Factors for Successful International Brands

5. Brand Architectures and Types of Branding
   5.1 Brand Hierarchies
   5.2 Co-branding and Ingredient Branding

6. Brand Management and Communication
   6.1 Classic Brand Communication
   6.2 Brand Communication on the Internet

7. Brand Expansion
   7.1 Basics of Brand Extension
   7.2 Opportunities and Risks of Brand Extension
   7.3 Ideal Typical Sequence of the Brand Extension Process

8. Brand Management According to the Stakeholder Concept
   8.1 Basics of Brand Management According to the Stakeholder Principle
   8.2 Stakeholder Groups: Consumer Stakeholder Groups
   8.3 Stakeholder Groups: Shareholders and Financial Investors
   8.4 Stakeholder Groups: Employees
   8.5 Stakeholder Groups: Suppliers and the Public
9. Brand Control
   9.1 Basics of Brand Controlling
   9.2 Importance and Measurement of Brand Value (Brand Status Analyses)
   9.3 Practical Methods for Measuring Brand Value

10. Trademark Protection
    10.1 Object of Trademark Protection
    10.2 Origin of Trademark Protection
    10.3 Trademark Infringements

Literature

Compulsory Reading

Further Reading
Study Format myStudies

Study Format  | Course Type
---|---
myStudies  | Lecture

Information about the examination

| Examination Admission Requirements | BOLK: yes  
Course Evaluation: no |
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Student Workload

| Self Study | Presence | Tutorial | Self Test | Practical Experience | Hours Total |
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| 90 h | 0 h | 30 h | 30 h | 0 h | 150 h |

Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
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### Instructional Methods

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www.iu.org
### Applied Sales

**Module Code:** DLBDSEAS

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**Module Coordinator**

Prof. Dr. Patrick Geus (Applied Sales I) / Prof. Dr. Patrick Geus (Applied Sales II)

**Contributing Courses to Module**

- Applied Sales I (DLBDSEAS01)
- Applied Sales II (DLBDSEAS02)

**Module Exam Type**

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**Weight of Module**

see curriculum
## Module Contents

### Applied Sales I
- Fundamentals of Applied Sales
- The Distribution System
- Personal Sales
- Sales Plans
- New Customer Acquisition
- A Sales Visit
- Conversational Tactics
- Conducting Negotiations
- Other Sales Channels

### Applied Sales II
- Marketing and Sales
- Customer Satisfaction as a Success Factor
- Personalities in Sales
- Customer-Oriented Communication
- Presentation and Rhetoric
- Customer Loyalty
- Networking
- Case Study
Learning Outcomes

Applied Sales I
On successful completion, students will be able to

▪ understand the fundamentals of applied sales and place them in the context of the company.
▪ understand the interaction of the individual facets of applied sales.
▪ differentiate between and evaluate individual sales systems.
▪ describe current sales types and sales characteristics.
▪ oversee and classify the entire sales process from customer acquisition to customer retention.
▪ understand the basics of sales and negotiation management and apply them.
▪ name the usual sales instruments, recognize their advantages and disadvantages, and reflect on essential fields of application and possibilities.

Applied Sales II
On successful completion, students will be able to

▪ understand the interaction and the respective areas of responsibility of marketing and sales.
▪ reflect on and classify the goals and measures within the framework of the applied sales system.
▪ assess the relevance of customer satisfaction and retention. In addition, the students will be familiar with the central design elements of CRM.
▪ reflect on and assess alternative approaches to customer loyalty and relationship management and apply them in business practice.
▪ understand the meaning of the terms customer life cycle and customer value, and develop approaches to manage them in the sense of the respective sales targets.
▪ use descriptive presentation techniques in order to convince customers and other sales partners.
▪ understand the relevance of networking and develop strategies to broaden the contact base.
▪ develop and evaluate their own market analyses and sales concepts on the basis of practical experience within the framework of the case study.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the Marketing & Communication fields
Applied Sales I
Course Code: DLBDSEAS01

<table>
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Course Description
The demands on sales thinking are growing every day. Globalized demand combined with high competition is making it increasingly difficult for companies to compete for customers. At the same time, customers are becoming better informed, while traditional supply markets are saturated and at overcapacity. In order to be successful in such an environment, sales thinking and action are required along with a new type of salesperson. Within the course Applied Sales I (Introduction), the participants are familiarized with the basic concepts of applied sales. You will learn about sales organization, dealing with alternative sales channels, and get to know the dedicated sales planning process. The contents of the module are complemented by the successful acquisition of new customers, whereby particular attention is paid to the organization and implementation of customer visits and the conduct of discussions and negotiations.

Course Outcomes
On successful completion, students will be able to
- understand the fundamentals of applied sales and place them in the context of the company.
- understand the interaction of the individual facets of applied sales.
- differentiate between and evaluate individual sales systems.
- describe current sales types and sales characteristics.
- oversee and classify the entire sales process from customer acquisition to customer retention.
- understand the basics of sales and negotiation management and apply them.
- name the usual sales instruments, recognize their advantages and disadvantages, and reflect on essential fields of application and possibilities.

Contents
1. Fundamentals of Applied Sales and Distribution
   1.1 Tasks and Forms of Applied Distribution
   1.2 Marketing as the Basis of Sales
   1.3 Distribution, Sales, and Other Terms
   1.4 Sales in Different Economic Sectors
2. The Distribution System
   2.1 Forms of Sales
   2.2 Sales Organisation
   2.3 Key Account Management
   2.4 Multi-Channel Distribution

3. Personal Sales
   3.1 The "New Sellers"
   3.2 Requirements for Sales Personalities
   3.3 The Key Account Manager
   3.4 Task of Sales Managers

4. Sales Plan
   4.1 Tasks and Objectives of Sales Management
   4.2 Observation of Competition in the Context of Sales Management
   4.3 Potential Analyses and Sales Planning
   4.4 Sales Control and Visit Strategies

5. New Customer Acquisition
   5.1 Identification of New Customer Potential
   5.2 Customer Relationship Management and Customer Acquisition
   5.3 Trade Fairs and Events
   5.4 Networking

6. The Sales Visit
   6.1 Frequency and Preparation of Visits
   6.2 Conduct of a Visit
   6.3 Visit Reports and Follow-Up
   6.4 Aftercare and Follow-Up

7. Conversational Tactics
   7.1 Structured Conversation Preparation
   7.2 Goal-Oriented Conversation: The D.A.L.A.S Model
   7.3 Questioning Techniques
8. Conducting Negotiations
   8.1 Psychology of Negotiation
   8.2 Negotiation Structure
   8.3 Objection Handling
   8.4 Price Negotiations

9. Other Sales Channels
   9.1 Telemarketing
   9.2 Catalogue and Brochure Sales
   9.3 Internet and E-Commerce

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**Literature**

**Compulsory Reading**

**Further Reading**

## Study Format Distance Learning

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| Type of Exam | Exam |

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## Instructional Methods

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- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
**Course Description**

The course Applied Sales II builds on the basics taught in the course "Applied Sales I" and broadens and deepens them. First, the tension between marketing and sales is examined in more detail. Based on this, essential backgrounds and central target figures for successful sales management (e.g., customer satisfaction and loyalty as well as the customer life cycle) are derived and operationalized in order to create the basis for efficient and effective customer relationship management. As the process progresses, attention will also be paid to mental processes and consumer behavior in general. In addition, strategies and paths to successful negotiation are deepened and supplemented by convincing communication techniques. The course concludes with a case study in the course of which the students have the opportunity to apply what they have learned in a practice-oriented manner.

**Course Outcomes**

On successful completion, students will be able to

- understand the interaction and the respective areas of responsibility of marketing and sales.
- reflect on and classify the goals and measures within the framework of the applied sales system.
- assess the relevance of customer satisfaction and retention. In addition, the students will be familiar with the central design elements of CRM.
- reflect on and assess alternative approaches to customer loyalty and relationship management and apply them in business practice.
- understand the meaning of the terms customer life cycle and customer value, and develop approaches to manage them in the sense of the respective sales targets.
- use descriptive presentation techniques in order to convince customers and other sales partners.
- understand the relevance of networking and develop strategies to broaden the contact base.
- develop and evaluate their own market analyses and sales concepts on the basis of practical experience within the framework of the case study.
Contents

1. Marketing and Sales
   1.1 Marketing Tasks and Functions
   1.2 Sales Marketing in Different Economic Sectors
   1.3 Relationship Marketing
   1.4 International Marketing and Sales Cooperations

2. Customer Satisfaction as a Success Factor
   2.1 Customer Relationship Management (CRM)
   2.2 The CRM Success Chain
   2.3 Customer Relationship Strategies

3. Personalities in Sales
   3.1 Sales Personalities and Differentiation
   3.2 Selling in Teams
   3.3 Negotiating With Committees

4. Customer-Oriented Communication
   4.1 Communication Tasks in Sales
   4.2 Sales Promotion by Sales Staff
   4.3 Team Sales Promotion
   4.4 Sales Promotion by the Company

5. Presentation and Rhetoric
   5.1 Rhetoric in Sales
   5.2 Presentation Techniques
   5.3 Nonverbal Communication

6. Customer Loyalty
   6.1 Customer Retention Management
   6.2 Customer Programs and Other Customer Loyalty Tools
   6.3 Complaint Management

7. Networking
   7.1 Network Competencies in the Company
   7.2 Building and Shaping Relationships
   7.3 Networking via Social Media

www.iu.org
8. Case Study in IQ Media Marketing
   8.1 The Market Situation
   8.2 The Marketing Situation
   8.3 IQ Media Marketing and IQ Digital Media Marketing

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Student Workload

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- ☐ Creative Lab
- ☐ Guideline
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## Supply Chain Management

**Module Code:** DLBDSESCM

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**Module Coordinator**

Prof. Dr. Hubert Vogl (Supply Chain Management I) / N.N. (Supply Chain Management II)

**Contributing Courses to Module**

- Supply Chain Management I (DLBDSESCM01)
- Supply Chain Management II (DLBDSESCM02)

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**Weight of Module**

see curriculum
Module Contents

Supply Chain Management I
- Historical and terminological aspects of the SCM concept
- Motives for the creation of cross-company value creation networks
- Design principles and effects of value creation networks
- Logistical core processes and SCM
- Information technology aspects of the SCM concept
- Coordination and collaboration of the network partners
- Industry-specific solutions of the SCM

Supply Chain Management II
- Strategic aspects of SCM
- SCM Practice: Tasks and Activities in the Core Planning Process
- SCM Practice: Tasks and Activities in the Core Process of Procurement
- SCM Practice: Tasks and Activities in the Core Process Production
- SCM Practice: Tasks and Activities in the Core Distribution Process
Learning Outcomes

Supply Chain Management I
On successful completion, students will be able to

▪ explain the importance of cross-company value creation processes.
▪ understand common concepts for modeling cross-company value creation processes.
▪ understand dynamic effects in supply chains and can systematize their causes and effects.
▪ explain important theoretical concepts for describing the characteristics and challenges of cross-company value creation processes.
▪ explain the approaches and problem categories commonly used in the context of supply chain management.
▪ understand important reference and/or management models for the concretization of supply chain systems.
▪ name and detail important roles and tasks in the SCM network.
▪ deal with the coordination problem of SCM and describe the common solution approaches.

Supply Chain Management II
On successful completion, students will be able to

▪ systematically explain the strategic relevance of enterprise-wide value creation processes.
▪ understand the most important tasks and problems in the SCM core process planning.
▪ systematize the elements and interrelationships in the CPFR model in a differentiated way.
▪ be familiar with the characteristics and peculiarities of contract logistics.
▪ understand the most important tasks and problems in the SCM core process procurement.
▪ explain central elements and characteristics of a procurement strategy.
▪ understand the most important tasks and problems in the SCM core process production.
▪ explain central elements and characteristics of a modern production strategy.
▪ understand the most important tasks and problems in the SCM core process distribution.
▪ explain central elements and characteristics of the so-called ECR concept.

Links to other Modules within the Study Program
This module is similar to other modules in the fields of Logistics & Transportation

Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the Transport & Logistics fields

www.iu.org
Supply Chain Management I

Course Code: DLBDSESCM01

Course Description
SCM proves to be an extremely multi-faceted construct from both a theoretical and a practical point of view. An adequate understanding of the problem dimensions and modes of action of (global) cross-company value creation networks requires a multidimensional approach. It starts by considering logistical processes, with modern process, flow, and network standards forming an important basis for SCM. On the basis of such an approach, students should gain a fundamental understanding of SCM. From the point of view of a holistic approach, it also makes sense to also examine a number of other typical problem areas in addition to the logistical challenges of this concept. This includes IT aspects of SCM (e.g., APS systems), and questions to do with the collaboration and coordination of network partners. This course also considers selected industry specific SCM solutions (ECR or VMI).

Course Outcomes
On successful completion, students will be able to

▪ explain the importance of cross-company value creation processes.
▪ understand common concepts for modeling cross-company value creation processes.
▪ understand dynamic effects in supply chains and can systematize their causes and effects.
▪ explain important theoretical concepts for describing the characteristics and challenges of cross-company value creation processes.
▪ explain the approaches and problem categories commonly used in the context of supply chain management.
▪ understand important reference and/or management models for the concretization of supply chain systems.
▪ name and detail important roles and tasks in the SCM network.
▪ deal with the coordination problem of SCM and describe the common solution approaches.

Contents
1. Fundamentals of the Supply Chain Concept
   1.1 Terminological and Conceptual Fundamentals
   1.2 Supply Chain Typology According to Otto
   1.3 Supply Chain Typology According to Bechtel/Jayaram
   1.4 Dynamic Aspects of Supply Chains
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<tr>
<td>2. Selected Theoretical Concepts for the Supply Chain Concept</td>
<td>2.1 New Institutional Economics</td>
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<td>2.2 Game Theory</td>
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<td>3. Supply Chain Management</td>
<td>3.1 Basic Information on the Goals and Scope of SCM</td>
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<td>3.2 Popular Problem Areas of the SCM</td>
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<td>3.3 Supply Chain Management as an Evolutionary Step in Logistics</td>
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<td>3.4 Supply Chain Management as Cooperation Management</td>
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<td>4. SCM Model</td>
<td>4.1 Basic Information on the Term SCM Models</td>
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<td>4.2 SCOR Model</td>
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<td>4.3 SCM Task Model</td>
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<td>5. SCM as a Coordination Problem</td>
<td>5.1 Basic Information on the Concept of Coordination</td>
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<td></td>
<td>5.2 Coordination Concepts, Context, and Perspectives of SCM</td>
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### Literature

#### Compulsory Reading

**Further Reading**

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Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
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## Instructional Methods

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- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Supply Chain Management II  
Course Code: DLBDSMECM02

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Course Description
From the perspective of strategic management research and practice, the activities covered by the term SCM are closely related to efforts to build and/or maintain a stable operational competitive advantage. A fundamental discussion of this relationship forms the starting point for the course. On this basis, a differentiated analysis of strategy-relevant activities and instruments in the Plan, Source, Make, Deliver, and Return process categories is then carried out using the SCOR model. Special attention is given to the practice-relevant areas of SCM, e.g., order-promising (plan), supplier-relation-management (source), postponement (make), and the ECR-concept (deliver).

Course Outcomes
On successful completion, students will be able to:

▪ systematically explain the strategic relevance of enterprise-wide value creation processes.
▪ understand the most important tasks and problems in the SCM core process planning.
▪ systematize the elements and interrelationships in the CPFR model in a differentiated way.
▪ be familiar with the characteristics and peculiarities of contract logistics.
▪ understand the most important tasks and problems in the SCM core process procurement.
▪ explain central elements and characteristics of a procurement strategy.
▪ understand the most important tasks and problems in the SCM core process production.
▪ explain central elements and characteristics of a modern production strategy.
▪ understand the most important tasks and problems in the SCM core process distribution.
▪ explain central elements and characteristics of the so-called ECR concept.

Contents
1. Strategic Aspects of SCM
   1.1 Strategic Thinking and Action: General Information
   1.2 Competition Focus and SCM
   1.3 Competition Location and SCM
   1.4 Competition Rules and SCM
2. SCM Practice: Core Process Planning
   2.1 General Preliminary Considerations
   2.2 Collaborative Planning, Forecasting, and Replenishment
   2.3 Order Promoting
   2.4 Kanban
   2.5 Integration of X-PL Logistics Service Providers

3. SCM Practice: Core Process Procurement
   3.1 General Preliminary Considerations
   3.2 Production Synchronous Procurement
   3.3 Sourcing Concepts
   3.4 Supplier Relations Management

4. SCM Practice: Core Process Production
   4.1 Selected Aspects of the Problem Background
   4.2 Collaborative Engineering
   4.3 Postponement Strategies
   4.4 Value Added Partnership

5. SCM Practice: Core Process Distribution
   5.1 Basic Information on the Distribution Problem
   5.2 Efficient Consumer Response (ECR)
   5.3 Consignment Warehouse
### Literature

**Compulsory Reading**

**Further Reading**

Study Format myStudies

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## Instructional Methods

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# Financial Services Management

**Module Code:** DLBDSEFSM

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**Module Coordinator**

N.N. (Financial Services Management I) / N.N. (Financial Services Management II)

**Contributing Courses to Module**

- Financial Services Management I (DLBDSEFSM01)
- Financial Services Management II (DLBDSEFSM02)

**Module Exam Type**

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**Weight of Module**

see curriculum
### Module Contents

#### Financial Services Management I
- Financial Markets and Financial Intermediaries
- Financial Intermediation in Germany
- Financial Services
- Debt Financing Through Financial Intermediaries
- Equity Financing Through Financial Intermediaries

#### Financial Services Management II
- Fundamentals of the Monetary and Asset Situation
- Investment in Money
- Investment in Tangible Assets
- Investment Funds and Certificates
- Insurance Financial Services

### Learning Outcomes

#### Financial Services Management I
On successful completion, students will be able to
- know the role of a financial service provider as a financier as well as how individual markets function in the financing sector.
- understand the basic relationships between the different financial services and their (supervisory) legal frameworks.
- evaluate the potential influence of the financial services sector on the real economy.
- familiarize themselves with the financing services offered both for external financing and for self-financing.
- assess the importance of financial services in the form of debt and equity financing in the short, medium, and long term.

#### Financial Services Management II
On successful completion, students will be able to
- systematize the different possibilities for the investment of financial surpluses.
- with the help of knowledge gained regarding conflicts involved in making financial investments, apply different aspects of investment decision-making to financial instruments.
- assess the various forms of investment in order of their safety.
- analyze the various forms of investment in terms of risk and return.
- understand that investment funds, certificates, and derivatives are modern products of financial service providers, which bring high returns and sometimes high risk.

### Links to other Modules within the Study Program
This module is similar to other modules in the fields of Finance & Tax Accounting

### Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management fields

www.iu.org
Financial Services Management I
Course Code: DLBDSFM01

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Course Description
The course explains the origin and constitution of the financial market. As a result of the imperfection of the financial market, the necessity of financial intermediaries is theoretically derived, which leads to the thesis of disintermediation. Since the German financial market is determined by regulations and supervision, the legal framework is discussed. The financial services of banks and other specialized financial intermediaries are presented. The main forms of debt financing through financial intermediaries are presented as well as financing with equity capital.

Course Outcomes
On successful completion, students will be able to

- know the role of a financial service provider as a financier as well as how individual markets function in the financing sector.
- understand the basic relationships between the different financial services and their (supervisory) legal frameworks.
- evaluate the potential influence of the financial services sector on the real economy.
- familiarize themselves with the financing services offered both for external financing and for self-financing.
- assess the importance of financial services in the form of debt and equity financing in the short, medium, and long term.

Contents
1. Financial Markets and Financial Intermediaries
   1.1 Origin and Basic Problems of the Financial Market
   1.2 Appearances and Functions of Financial Intermediaries
2. Financial Intermediation
   2.1 The Banking System
   2.2 Asset Management Companies and Insurance Companies
   2.3 Regulations and Supervision
3. Financial Services
   3.1 Financing Needs
   3.2 The Range of Financial Services
4. Debt Financing Through Financial Intermediaries
   4.1 Types of Loans
   4.2 Lending and Collateralization
   4.3 Credit Substitutes

5. Equity Financing Through Financial Intermediaries
   5.1 Equity Financing Through Capital Participation and Venture Financing Companies
   5.2 Equity Capital Markets Issuance
   5.3 Disintermediation in Finance

### Literature

#### Compulsory Reading

#### Further Reading
### Study Format Distance Learning

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
Financial Services Management II
Course Code: DLBDSEFSM02

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Course Description
In this course, the different possibilities of investing financial surpluses are systematized. The conflicting relationship between the risks, returns, and liquidity of a financial investment are presented, and the different aspects of decision-making for investment in one of the financial instruments are shown. The various forms of investment (monetary values, tangible assets) are presented in the order of their security. The functions that insurance companies perform as financial service providers complete the picture. The different forms of life insurance and their role in old-age provision are presented.

Course Outcomes
On successful completion, students will be able to
- systematize the different possibilities for the investment of financial surpluses.
- with the help of knowledge gained regarding conflicts involved in making financial investments, apply different aspects of investment decision-making to financial instruments.
- assess the various forms of investment in order of their safety.
- analyze the various forms of investment in terms of risk and return.
- understand that investment funds, certificates, and derivatives are modern products of financial service providers, which bring high returns and sometimes high risk.

Contents
1. Basic Information on Investing Money and Assets
   1.1 Basic Concepts of Money and Asset Investment
   1.2 Framework Conditions for Decisions on Plants
   1.3 Investment Products
2. Investment in Money
   2.1 Investment in Accounts
   2.2 Savings Bonds
   2.3 Fixed-Interest Securities
### 3. Investment in Tangible Assets
- **3.1 Shares**
- **3.2 Stock Exchange Trading**
- **3.3 Investment in Real Estate**

### 4. Investment Funds and Certificates
- **4.1 Mutual Funds**
- **4.2 Fund of Funds and Hedge Funds**
- **4.3 Derivatives**

### 5. Insurance Financial Services
- **5.1 Fundamentals of the Insurance Industry**
- **5.2 The Life Insurances**

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#### Literature

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### Instructional Methods

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- ☑ Course Book
- ☐ Vodcast
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- ☐ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
## Business Intelligence

### Module Code: DLBCSEBI

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### Module Coordinator

Prof. Dr. Sebastian Werning (Business Intelligence) / Prof. Dr. Sebastian Werning (Project: Business Intelligence)

### Contributing Courses to Module

- Business Intelligence (DLBCSEBI01)
- Project: Business Intelligence (DLBCSEBI02)

### Module Exam Type

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### Weight of Module

see curriculum
Module Contents

Business Intelligence
- Basics of mobile software development
- Android system architecture
- Development environment
- Core components of an Android app
- Interaction between application components
- Advanced techniques

Project: Business Intelligence
Conception, implementation, and documentation of small, mobile applications on the basis of a concrete task.

Learning Outcomes

Business Intelligence
On successful completion, students will be able to
- explain the motivation, use cases, and basics of Business Intelligence.
- identify and explain techniques and methods for providing and modeling data, as well as types of data relevant to BI, differentiating between them.
- explain techniques and methods for the generation and storage of information and independently select suitable methods on the basis of concrete requirements.

Project: Business Intelligence
On successful completion, students will be able to
- independently design a solution to a practical problem in the field of Business Intelligence in order to then implement a prototype and document the results.
- identify and explain typical problems and challenges in the design and practical implementation of small BI 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 IU International University of Applied Sciences
All Bachelor Programmes in the IT & Technology fields
Business Intelligence
Course Code: DLBCSEBI01

Course Description
Business Intelligence (BI) is used to obtain information from company data that is relevant for targeted corporate management and the optimization of business activities. This course introduces and discusses techniques, procedures, and models for data provision, information generation, and analysis, as well as the distribution of the information obtained. You will then be able to explain the various subject areas of data warehousing and independently select methods and techniques to meet specific requirements.

Course Outcomes
On successful completion, students will be able to

- explain the motivation, use cases, and basics of Business Intelligence.
- identify and explain techniques and methods for providing and modeling data, as well as types of data relevant to BI, differentiating between them.
- explain techniques and methods for the generation and storage of information and independently select suitable methods on the basis of concrete requirements.

Contents
1. Motivation and Conceptualization
   1.1 Motivation and Historical Development
   1.2 BI as a Framework
2. Data Provision
   2.1 Operative and Dispositive Systems
   2.2 The Data Warehouse Concept
   2.3 Architectural Variations
3. Data Warehouse
   3.1 ETL Process
   3.2 DWH and Data Mart
   3.3 ODS and Metadata
4. Modelling of Multidimensional Data Spaces
   4.1 Data Modeling
   4.2 OLAP Cubes
   4.3 Physical Storage
   4.4 Star and Snowflake Scheme
   4.5 Historicization

5. Analysis Systems
   5.1 Free Data Research and OLAP
   5.2 Reporting Systems
   5.3 Model-Based Analysis Systems
   5.4 Concept-Oriented Systems

6. Distribution and Access
   6.1 Information Distribution
   6.2 Information Access

**Literature**

**Compulsory Reading**

**Further Reading**
## Study Format Distance Learning

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<thead>
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<th>Study Format</th>
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## Student Workload

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Project: Business Intelligence
Course Code: DLBCSEBI02

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**Course Description**
Using well-known methods and techniques from the field of Business Intelligence, students will work independently on a practical question in this course. At the end of the course you will be able to independently design and prototype Business Intelligence applications based on concrete requirements.

**Course Outcomes**
On successful completion, students will be able to

- independently design a solution to a practical problem in the field of Business Intelligence in order to then implement a prototype and document the results.
- identify and explain typical problems and challenges in the design and practical implementation of small BI solutions.

**Contents**

- Implementation and documentation of practical questions regarding the use of Business Intelligence applications. Typical scenarios are, for example, “Management of BI projects”, “Design of multidimensional data models” and “Prototypical implementation of small BI applications”.

**Literature**

**Compulsory Reading**

**Further Reading**

**Study Format Distance Learning**

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| Type of Exam                        | Written Assessment: Project Report |

**Student Workload**

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**Instructional Methods**

- Learning Sprints®
- Course Book
- Vodcast
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- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
# Smart Devices

**Module Code:** DLBINGSD_E

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**Module Coordinator**

N.N. (Smart Devices I) / N.N. (Smart Devices II)

**Contributing Courses to Module**

- Smart Devices I (DLBINGSD01_E)
- Smart Devices II (DLBINGSD02_E)

**Module Exam Type**

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</table>

**Weight of Module**

see curriculum
Module Contents

Smart Devices I
- Overview and introduction
- Smart devices
- Technological features
- Communication and networking
- User interfaces
- Ubiquitous computing

Smart Devices II
- Overview and introduction
- Smart devices
- Technological features
- Communication and networking
- User interfaces
- Ubiquitous computing

Learning Outcomes

Smart Devices I
On successful completion, students will be able to
- recall the historical development of assistance systems towards smart devices.
- classify and define different types and examples of smart devices with regard to their properties.
- know typical features of smart devices.
- identify different communication standards with which smart devices can communicate with their environment.
- recognize different approaches with which smart devices can be controlled.
- classify smart devices as elements of ubiquitous computing.

Smart Devices II
On successful completion, students will be able to
- have an in-depth understanding of the technologies and standards in the context of smart devices.
- apply technologies in the context of smart devices using a simple practical example.
- design a hardware or software prototype for a selected task.
- document design and development activities in the form of a project report.

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 IU International University of Applied Sciences
All Bachelor Programs in the IT & Technology fields

www.iu.org
Smart Devices I

Course Code: DLBINGSD01_E

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Course Description
In this course, students are familiarized with the properties and applications of smart devices. In doing so, the possible applications in the context of Industry 4.0 are specifically highlighted. For this purpose, current trends in microsystems technology are discussed alongside assistance functions in production, e.g., through data glasses or other wearables. In addition to the typical technological features, this course also teaches the basics of various interfaces with which a smart device interacts with its environment. These include, on the one hand, wireless system ports linked to other devices and, on the other hand, various selections for controlling the devices via a user interface. This course concludes with a classification of smart devices in the field of ubiquitous computing.

Course Outcomes
On successful completion, students will be able to

▪ recall the historical development of assistance systems towards smart devices.
▪ classify and define different types and examples of smart devices with regard to their properties.
▪ know typical features of smart devices.
▪ identify different communication standards with which smart devices can communicate with their environment.
▪ recognize different approaches with which smart devices can be controlled.
▪ classify smart devices as elements of ubiquitous computing.

Contents
1. Overview and Introduction
   1.1 Historical Development of Smart Devices
   1.2 Technological Pioneers for Smart Devices
   1.3 Smart Devices in the Internet of Things

2. Properties and Applications
   2.1 Typical Properties and Classification
   2.2 Example Devices
   2.3 Smart Devices in Microsystems Technology (MEMS)
   2.4 Further Fields of Application
3. Technological Features
   3.1 Processors
   3.2 Sensors
   3.3 Radio Interfaces

4. Communication and Networking
   4.1 Personal Area Networks
   4.2 Local Area Networks
   4.3 Body Area Networks
   4.4 Middleware for Smart Devices
   4.5 Open Core Interface

5. User Interfaces
   5.1 Touch Control
   5.2 Gesture Control
   5.3 Voice Control
   5.4 Multimodal Control

6. Ubiquitous Computing
   6.1 Aims and Basic Properties of Ubiquitous Systems
   6.2 Examples for Ubiquitous Systems
   6.3 Context Sensitivity
   6.4 Autonomy
   6.5 Smart Device Management
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**Study Format Fernstudium**

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**Student Workload**

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**Instructional Methods**

- ☐ Learning Sprints®
- ☒ Course Book
- ☐ Vodcast
- ☒ Shortcast
- ☒ Audio
- ☒ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
## Smart Devices II

**Course Code:** DLBINGSD02_E

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### Course Description

In this course, students select one assignment from the provided topic catalogue in consultation with the tutor. They work on the task with the help of a prototyping environment that fits the subject matter of the assignment. The environments can be hardware (e.g. prototyping boards) or software (e.g. technology-specific development environments). To complete the task, students apply concepts, methods and tools taught in the Smart Devices I course. They document their results in a project report.

### Course Outcomes

On successful completion, students will be able to

- have an in-depth understanding of the technologies and standards in the context of smart devices.
- apply technologies in the context of smart devices using a simple practical example.
- design a hardware or software prototype for a selected task.
- document design and development activities in the form of a project report.

### Contents

- A catalogue with currently available assignments is provided on the online learning platform. It provides the content basis of the module and can be supplemented or updated by the tutor.

### Literature

- **Compulsory Reading**
- **Further Reading**

www.iu.org
### Study Format Distance Learning

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### Student Workload

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
**Module Code:** DLBDSESF

### Module Type
- **see curriculum**

### Admission Requirements
- none

### Study Level
- BA

### CP
- 10

### Student Workload
- 300 h

### Semester / Term
- **see curriculum**

### Duration
- Minimum 1 semester

### Regularly offered in
- WiSe/SoSe

### Language of Instruction
- English

### Module Coordinator
- N.N. (Smart Factory I) / Prof. Dr. Christian Magnus (Smart Factory II)

### Contributing Courses to Module
- • Smart Factory I (DLBDSESF01)
- • Smart Factory II (DLBDSESF02)

### Module Exam Type

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<td><strong>Smart Factory II</strong></td>
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### Weight of Module
- **see curriculum**
Module Contents

Smart Factory I

▪ Motivation and Definition of Terms
▪ Development of Automation
▪ Technological Basics and Standards
▪ Basic concepts of a Smart Factory
▪ Reference Architectures
▪ Smart Factory Engineering
▪ Safety and Security

Smart Factory II

A catalogue with the currently provided tasks is provided on the online platform of the module. It provides the content basis of the module and can be supplemented or updated by the seminar leader.

Learning Outcomes

Smart Factory I

On successful completion, students will be able to

▪ understand the term Smart Factory in the context of Industry 4.0.
▪ be able to trace the development of automation to a fully autonomous, non-centrally organized production plant.
▪ understand the basic technologies and standards used to design and operate a Smart Factory.
▪ understand the essential concepts of a Smart Factory.
▪ identify and differentiate between the individual elements of a Smart Factory using different reference architectures.
▪ understand the special engineering challenges in the Smart Energy context.
▪ understand the special safety risks of digitized and networked production plants and assign concrete recommendations for action.

Smart Factory II

On successful completion, students will be able to

▪ have a deeper understanding of the technologies and standards in the context of Smart Factory.
▪ apply technologies in the context of Smart Factory to a simple practical example.
▪ design a hardware or software prototype for a selected task.
▪ document, design, and develop activities in the form of a project report.
<table>
<thead>
<tr>
<th>Links to other Modules within the Study Program</th>
<th>Links to other Study Programs of IU International University of Applied Sciences</th>
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<tbody>
<tr>
<td>This module is similar to other modules in the fields of Computer Science &amp; Software Development</td>
<td>All Bachelor Programmes in the IT &amp; Technology fields</td>
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Smart Factory I
Course Code: DLBDSESF01

### Course Description
In this course, students will gain a deeper insight into the networking and digitization of production facilities by examining a Smart Factory. For this purpose, they will be familiarized with the basic goals of a Smart Factory in the context of the research complex Industry 4.0. After a brief introduction to the history of automation, students will learn the technical basics and standards required to design and operate a Smart Factory. Building on this, they will learn how these individual technologies are used to implement the central concepts of a Smart Factory. In order to understand which components a Smart Factory consists of, different reference architectures are presented and compared. The course concludes with the special engineering challenges of an autonomously acting and decentralized production plant. Above all, this includes IT security, which is particularly relevant due to the digital networking of production facilities and products.

### Course Outcomes
On successful completion, students will be able to

- understand the term Smart Factory in the context of Industry 4.0.
- be able to trace the development of automation to a fully autonomous, non-centrally organized production plant.
- understand the basic technologies and standards used to design and operate a Smart Factory.
- understand the essential concepts of a Smart Factory.
- identify and differentiate between the individual elements of a Smart Factory using different reference architectures.
- understand the special engineering challenges in the Smart Energy context.
- understand the special safety risks of digitized and networked production plants and assign concrete recommendations for action.

### Contents
1. Motivation and Definition of Terms
   1.1 Goals of Smart Factory
   1.2 Internet of Things
   1.3 Cyber-Physical Systems
   1.4 Cyber-Physical Production Systems
   1.5 Smart Factory as a Cyber-Physical (Production) System
2. Development of Automation
   2.1 Automation Pyramid
   2.2 Networked, Decentralized Organization of Production
   2.3 Future Challenges

3. Technological Basics and Standards
   3.1 Identification of Physical Objects
   3.2 Formal Description Languages and Ontologies
   3.3 Digital Object Memory
   3.4 Physical Situation Recognition
   3.5 (Partially) Autonomous Action and Cooperation
   3.6 Human-Machine Interaction
   3.7 Machine to Machine Communication

4. Basic Concepts of a Smart Factory
   4.1 Order-Controlled Production
   4.2 Bundling of Machine and Production Data
   4.3 Supporting People in Production
   4.4 Intelligent Products and Resources
   4.5 Smart Services

5. Reference Architectures
   5.1 Purpose and Properties of Reference Architectures
   5.2 Overview of Standardization Initiatives
   5.3 CyProS Reference Architecture
   5.4 RAMI 4.0 (DIN SPEC 91345)

6. Smart Factory Engineering
   6.1 Classification of Different Engineering Tools
   6.2 Virtual Engineering
   6.3 User-Centered Design
   6.4 Requirements Engineering
   6.5 Modelling
   6.6 Integration of Classic and Smart Components
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### Instructional Methods

- □ Learning Sprints®
- ☑ Course Book
- ☑ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- □ Review Book
- □ Creative Lab
- □ Guideline
- ☑ Live Tutorium/Course Feed
Smart Factory II
Course Code: DLBDSESF02

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**Course Description**

In this course, students select a concrete task from the catalog of topics provided in consultation with the seminar leader. They will work on the task in a prototyping environment suited to the task, which can be either a hardware (e.g., prototyping boards) or software (e.g., technology-specific development environments) environment. To complete the task, students apply the concepts, methods, and tools taught in the Smart Factory I course. They document their results with a project report.

**Course Outcomes**

On successful completion, students will be able to

- have a deeper understanding of the technologies and standards in the context of Smart Factory.
- apply technologies in the context of Smart Factory to a simple practical example.
- design a hardware or software prototype for a selected task.
- document, design, and develop activities in the form of a project report.

**Contents**

- A catalogue with the currently provided tasks is provided on the online platform of the module. It provides the content basis of the module and can be supplemented or updated by the seminar leader.

**Literature**

**Compulsory Reading**

**Further Reading**
### Study Format Distance Learning

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### Instructional Methods

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- Creative Lab
- Guideline
- Live Tutorium/Course Feed
- Guideline
- Live Tutorium/Course Feed
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**Module Coordinator**
N.N. (Smart Mobility I) / N.N. (Smart Mobility II)

**Contributing Courses to Module**
- Smart Mobility I (DLBINGSM01_E)
- Smart Mobility II (DLBINGSM02_E)

**Module Exam Type**

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<td>• Study Format “Distance Learning”: Written Assessment: Project Report</td>
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**Weight of Module**
see curriculum
Module Contents

Smart Mobility I
▪ Introduction and Definitions
▪ Overview over traditional mobility infrastructure approaches
▪ Alternative approaches to mobility
▪ Services for smart mobility
▪ Overview over relevant technologies and standards
▪ Car2X Communication
▪ Examples and use-cases

Smart Mobility II
In-depth analysis of a specific topic in the context of Smart Mobility in form of a prototype report.

Learning Outcomes

Smart Mobility I
On successful completion, students will be able to
▪ remember several types of mobility.
▪ understand distinct reasons for designing intelligent mobility systems.
▪ analyze diverse types of mobility infrastructure regarding their properties and access requirements.
▪ understand various alternative mobility approaches.
▪ remember a range of services that relevant for Smart Mobility.
▪ understand the relevant technologies and standards for connecting infrastructure elements and services.
▪ understand use cases for Car2X communication and the relevant standards and technologies.
▪ remember example projects in the context of Smart Mobility.

Smart Mobility II
On successful completion, students will be able to
▪ have an in-depth understanding of the technologies and standards in the context of Smart Mobility.
▪ apply technologies in the context of Smart Mobility using a simple practical example.
▪ design a hardware or software prototype for a selected task.
▪ document design choices and development tasks in the form of a project report.

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 IU International University of Applied Sciences
All Bachelor Programs in the IT & Technology fields

www.iu.org
Smart Mobility I
Course Code: DLBINGSM01_E

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Course Description
This course gives an introduction and overview into the future of mobility. Starting from an understanding of traditional and current mobility infrastructure, alternative approaches are introduced. The course discusses a range of services that are typical for smart mobility solutions. The course includes a detailed discussion on technologies and standards relevant for smart mobility, in particular in Car2X communication. A range of projects and examples are discussed to illustrate the application of smart mobility approaches in a real-life context.

Course Outcomes
On successful completion, students will be able to
• remember several types of mobility.
• understand distinct reasons for designing intelligent mobility systems.
• analyze diverse types of mobility infrastructure regarding their properties and access requirements.
• understand various alternative mobility approaches.
• remember a range of services that relevant for Smart Mobility.
• understand the relevant technologies and standards for connecting infrastructure elements and services.
• understand use cases for Car2X communication and the relevant standards and technologies.
• remember example projects in the context of Smart Mobility.

Contents
1. Introduction and Definitions
   1.1 Types of Mobility
   1.2 Smart Mobility and Smart City
   1.3 Efficient use of energy
   1.4 Emissions
   1.5 Security
   1.6 Comfort
   1.7 Cost Effectiveness
2. Overview over traditional mobility infrastructure approaches
   2.1 Properties and Access Requirements
   2.2 Infrastructure Planning
   2.3 Disadvantages of Isolated Infrastructures

3. Alternative approaches to mobility
   3.1 Park and Ride
   3.2 Car-Sharing
   3.3 Rent A Bike
   3.4 Carpooling

4. Services for smart mobility
   4.1 Authorization
   4.2 Payment
   4.3 Booking
   4.4 Navigation
   4.5 Security
   4.6 Hybrid Services

5. Overview over relevant technologies and standards
   5.1 Mobile Devices
   5.2 Mobile Networks and Wireless LAN
   5.3 NFC and RFID
   5.4 Outdoor and Indoor Localization
   5.5 Technologies for Traffic Monitoring

6. Car2X Communication
   6.1 Use Cases
   6.2 Elements of a Car2X System
   6.3 Technologies and Standards
   6.4 Sample Implementations

7. Examples and use-cases
   7.1 Octopus (Hong Kong)
   7.2 Amsterdam Practical Trial
   7.3 Mobincity
## Literature

### Compulsory Reading

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<tr>
<td>Fluegge, B.</td>
<td>Smart Mobility – Connecting Everyone: Trends, Concepts and Best Practices</td>
<td>Springer/Vierweg</td>
<td>Wiesbaden</td>
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<tr>
<td>Handke, V./Jonuschat, H.</td>
<td>Flexible Ridesharing. New Opportunities and Service Concepts for Sustainable Mobility</td>
<td>Springer</td>
<td>Berlin/Heidelberg</td>
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<tr>
<td>Papa, R./Fistola, R./Gargiulo, C.</td>
<td>Smart Planning: Sustainability and Mobility in the Age of Change (Green Energy and Technology)</td>
<td>Springer</td>
<td>London</td>
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<tr>
<td>Planing, P. et al</td>
<td>Innovations for Metropolitan Areas: Intelligent Solutions for Mobility, Logistics and Infrastructure designed for Citizens</td>
<td>Springer</td>
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<tr>
<td>Sashinskaya, M.</td>
<td>Smart Cities in Europe. Open Data in a Smart Mobility Context.</td>
<td>Createspace Independent Publishing Platform</td>
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### Further Reading

### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Smart Mobility II
Course Code: DLBINGSM02_E

Course Description
In the course Smart Mobility II, students are asked to choose an assignment provided by the course tutor to apply the concepts and methods covered in Smart Mobility I in a specific use case or application area. The students will develop a prototype focused on a specific topic related to smart mobility. The prototype can be developed either as a hardware setup or a software solution. The students document their results in a project report.

Course Outcomes
On successful completion, students will be able to
- have an in-depth understanding of the technologies and standards in the context of Smart Mobility.
- apply technologies in the context of Smart Mobility using a simple practical example.
- design a hardware or software prototype for a selected task.
- document design choices and development tasks in the form of a project report.

Contents
- A catalogue with currently available assignments is provided on the online learning platform. It provides the content basis of the module and can be supplemented or updated by the tutor.

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Student Workload

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### Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
- ☐ Vodcast
- ☐ Shortcast
- ☐ Audio
- ☐ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☒ Guideline
- ☐ Live Tutorium/Course Feed
### Smart Services

**Module Code:** DLBINGSS_E

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**Module Coordinator**

N.N. (Smart Services I) / N.N. (Smart Services II)

**Contributing Courses to Module**

- Smart Services I (DLBINGSS01_E)
- Smart Services II (DLBINGSS02_E)

**Module Exam Type**

**Module Exam**

**Split Exam**

- **Smart Services I**
  - Study Format "Distance Learning": Exam, 90 Minutes

- **Smart Services II**
  - Study Format "Distance Learning": Written Assessment: Project Report

**Weight of Module**

see curriculum
Module Contents

**Smart Services I**
- Digitization and disruption
- Potential of Smart Services
- Development and specification of Smart Services
- Service architectures
- Integration platforms
- Technologies for Smart Services
- Quality and operation of Smart Services

**Smart Services II**
Analysis of a selected topic of Smart Services and design of a self-chosen assignment in a prototyping environment.

Learning Outcomes

**Smart Services I**
On successful completion, students will be able to
- recognize the relevance of Smart Services in the context of digitization in general and Industry 4.0 in particular.
- identify special features of digital business models and demonstrate them using the example of digital intermediaries.
- apply methods to uncover digitization potentials and use the Business Model Canvas to classify them in a business model.
- know and use models for the multi-perspective specification of services.
- know selected architectures for the design and integration of services.
- distinguish different technologies that are required for the development of services.
- define the quality of services by means of Service Level Agreements.

**Smart Services II**
On successful completion, students will be able to
- have an in-depth understanding of the technologies and standards in the context of Smart Services.
- apply technologies in the context of smart services using a simple practical example.
- design a hardware or software prototype for a selected technical task.
- document design and development activities in the form of a project report.

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 IU International University of Applied Sciences
All Bachelor Programs in the IT & Technology fields
Smart Services I  
Course Code: DLBINGSS01_E

Course Description
In this course, students study concepts and methods for the development of Smart Services. For this purpose, an introduction of the term in the context of digitization and Industry 4.0 will be given. Based on this, this course shows how innovative services can have a disruptive effect on existing business models or even markets using the example of digital intermediaries. Subsequently, students will be taught selected methods and techniques with which digitization potentials can be recognized and modelled. In addition, selected architectures and platforms for the integration of services are presented. Finally, relevant technologies for the implementation of smart services are taught and it is briefly described how the quality of services can be agreed upon.

Course Outcomes
On successful completion, students will be able to
- recognize the relevance of Smart Services in the context of digitization in general and Industry 4.0 in particular.
- identify special features of digital business models and demonstrate them using the example of digital intermediaries.
- apply methods to uncover digitization potentials and use the Business Model Canvas to classify them in a business model.
- know and use models for the multi-perspective specification of services.
- know selected architectures for the design and integration of services.
- distinguish different technologies that are required for the development of services.
- define the quality of services by means of Service Level Agreements.

Contents
1. Introduction and Motivation
   1.1 Digitization and Cyber-Physical Production Systems
   1.2 Smart Services in Industry 4.0
   1.3 Examples of Smart Services
## 2. Digitization and Disruption

### 2.1 Definition: Digital Business Models

### 2.2 Strategies for Change and Innovation

### 2.3 Digital Intermediaries

### 2.4 Examples of Disruptive Business Models

## 3. Recognizing Potential for Smart Services

### 3.1 Business Model Canvas

### 3.2 Personas

### 3.3 Customer Journeys

### 3.4 Domain-Driven Design

## 4. Development and Specification of Smart Services

### 4.1 Modelling of the System Context

### 4.2 Modelling of Business Processes

### 4.3 Modelling of Technical Interfaces

### 4.4 Tools for API Specification

## 5. Service Architectures

### 5.1 Infrastructure/Platform/Software-as-a-Service

### 5.2 Everything-as-a-Service

### 5.3 Service-oriented Architectures

### 5.4 Micro Services

## 6. Integration Platforms

### 6.1 Features and Purpose of Integration Platforms

### 6.2 Enterprise Integration Patterns

### 6.3 External Integration with Zapier, IFTTT & Others

## 7. Technologies for Smart Services

### 7.1 Formats for Data Exchange

### 7.2 Internet Communication Protocols

### 7.3 Semantic Descriptions

### 7.4 Complex Event Processing

### 7.5 Security
8. Quality and Operation of Smart Services
   8.1 Quality Characteristics and Maturity of APIs
   8.2 Service Level Agreements
   8.3 Service Level Management

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### Instructional Methods

- ☐ Learning Sprints®
- ☑ Course Book
- ☐ Vodcast
- ☑ Shortcast
- ☑ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
Smart Services II
Course Code: DLBINGSS02_E

Study Level
BA
Language of Instruction
English
Contact Hours
CP 5
Admission Requirements
none

Course Description
In this course, the students select a concrete technical task from the provided topic catalogue in consultation with the seminar leader. They work on the task with the help of a prototyping environment that is suitable for the subject of the task. The environments can be hardware (e.g. prototyping boards) or software (e.g. technology-specific development environments). To complete the task, students apply the concepts, methods and tools taught in the Smart Services I course. They document their results in a project report.

Course Outcomes
On successful completion, students will be able to
- have an in-depth understanding of the technologies and standards in the context of Smart Services.
- apply technologies in the context of smart services using a simple practical example.
- design a hardware or software prototype for a selected technical task.
- document design and development activities in the form of a project report.

Contents
- A catalogue with currently available assignments is provided on the online learning platform. It provides the content basis of the module and can be supplemented or updated by the tutor.

Literature

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Further Reading
## Study Format Distance Learning

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcut
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
## IT Security Consulting

**Module Code:** DLBCSEEISC_E

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**Module Coordinator**

N.N. (Technical and Operational IT Security Concepts) / N.N. (Project: Configuration and Application of SIEM Systems)

**Contributing Courses to Module**

- Technical and Operational IT Security Concepts (DLBCSEEISC01_E)
- Project: Configuration and Application of SIEM Systems (DLBCSEEISC02_E)

**Module Exam Type**

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<td>Project: Configuration and Application of SIEM Systems</td>
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- Study Format "Distance Learning": Exam, 90 Minutes
- Study Format "Fernstudium": Written Assessment: Project Report

**Weight of Module**

see curriculum
Module Contents

Technical and Operational IT Security Concepts
- Network analysis and evaluation
- Protection Profiles
- Intrusion Detection Systems
- Network Monitoring
- Security Information and Event Management (SIEM)
- IT-Security evaluation and assessment

Project: Configuration and Application of SIEM Systems
- Network analysis and evaluation
- Protection Profiles
- Intrusion Detection Systems
- Network Monitoring
- Security Information and Event Management (SIEM)
- IT-Security evaluation and assessment

Learning Outcomes

Technical and Operational IT Security Concepts
On successful completion, students will be able to
- analyze and evaluate IT systems and networks and detect vulnerabilities.
- develop enterprise specific protection profiles.
- design and implement tools for sensor based network monitoring, intrusion detection and response.
- use Big Data fusion mechanisms, evaluate and assess the IT-system network security status and decide and initiate incident response measures.
- evaluate the security status of IT systems and networks and provide guidance for improvement.

Project: Configuration and Application of SIEM Systems
On successful completion, students will be able to
- understand the challenges of integrating a SIEM into an existing enterprise IT infrastructure.
- evaluate the constraints the implementation project imposes on the execution of a SIEM.
- identify the necessary intrusion detection and monitoring components required for reliable execution of the SIEM tool.
- analyze requirements regarding data acquisition, data fusion, analysis, and processing.
- identify deviation from normal behavior in IT systems / networks.
- initiate further deep investigation of malware samples and apply relevant response strategies - including automated responses.
<table>
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<th>Links to other Study Programs of IU International University of Applied Sciences</th>
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Technical and Operational IT Security Concepts

Course Code: DLBCSEEISC01_E

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Course Description
IT-Systems and Networks containing and processing highly sensitive information and data as well as IT-Infrastructure in support of business-critical processes or national critical infrastructure require higher security mechanism regarding confidentiality, integrity and availability. Based on specific “Protection Profiles” high sophisticated tools, mechanisms and procedures need to be designed, implemented, configurated and operated. With this course the student will be able to evaluate given IT-Infrastructure, support the security-design of new IT-Systems and Networks by developing specific Protection Profiles, evaluate which technical and operational security measures and application are required and how these are integrated, configurated and operated.

Course Outcomes
On successful completion, students will be able to
- analyze and evaluate IT systems and networks and detect vulnerabilities.
- develop enterprise specific protection profiles.
- design and implement tools for sensor based network monitoring, intrusion detection and response.
- use Big Data fusion mechanisms, evaluate and assess the IT-system network security status and decide and initiate incident response measures.
- evaluate the security status of IT systems and networks and provide guidance for improvement.

Contents
1. Network Analysis and Evaluation
   1.1 Layer Specific Threats and Vulnerabilities
   1.2 DATA Flow, Interdependencies and Interrelationships
   1.3 Vulnerability Scanning and Detection
   1.4 Supporting Tools and Techniques
2. Protection Profiles
   2.1 Reference Architecture Technology and Networking
   2.2 Risk Assessment, Residual Risk and Risk Management
   2.3 Security Requirements and Safeguards
   2.4 Security Evaluation of IT-Security Products
   2.5 Accreditation of IT-Systems and Networks

3. Intrusion Detection Systems
   3.1 Detection Strategy
   3.2 Data Sources, Sensors
   3.3 Analytics
   3.4 Indicators of Compromise

4. Network Monitoring
   4.1 Threat Protection Systems
   4.2 Wireless Sensor Networks Technology
   4.3 Threat Information Sharing

5. Security Information and Event Management (SIEM)
   5.1 Technical and Operational DATA Sources
   5.2 DATA Fusion
   5.3 Network Norm Behavior
   5.4 Big Data Analysis – Transferring Technical Data for Operational Information
   5.5 Security Situation Picture, Situational Awareness
   5.6 Incident Response Strategies and Automated Responses

6. IT-Security Evaluation and Assessment
   6.1 IT-Security Metrics
   6.2 IT-Security Assessment
## Literature

### Compulsory Reading

### Further Reading
**Study Format Distance Learning**

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**Student Workload**

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**Instructional Methods**

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Project: Configuration and Application of SIEM Systems

Course Code: DLBCSEEISC02_E

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Course Description
This course will give students hands-on experience in the challenging task of implementing a Security Incident Event Management (SIEM) Tool into an Enterprise IT-Environment. Students will need to consider practical aspects such as different data sources, data fusion and big data analytics methods and processing, as well as constraints such as data availability and multiple data formats. Furthermore, students will face the challenge to transfer technical data into operational Information to initiate valid responses. By the end of this course, students will have obtained well-founded knowledge of the integration of SIEM into enterprise IT infrastructure, applications and services.

Course Outcomes
On successful completion, students will be able to

- understand the challenges of integrating a SIEM into an existing enterprise IT infrastructure.
- evaluate the constraints the implementation project imposes on the execution of a SIEM.
- identify the necessary intrusion detection and monitoring components required for reliable execution of the SIEM tool.
- analyze requirements regarding data acquisition, data fusion, analysis, and processing.
- identify deviation from normal behavior in IT systems / networks.
- initiate further deep investigation of malware samples and apply relevant response strategies - including automated responses.

Contents
- This course focuses on practical aspects of the implementation of a SIEM into an enterprise IT infrastructure environment. Students start with a chosen use case and SIEM and then evaluate requirements which need to be fulfilled so that the SIEM can be used as part of an enterprise IT system / network. Students need to evaluate requirements for sensors, network monitoring, intrusion detection, data fusion, big data analytics, and translating technical data into operational information.
- Based on the available information, valid responses – including automated responses - will be identified and processed.
- All relevant artifacts and considerations are documented by the students in a project report.
### Literature

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| Type of Exam                        | Written Assessment: Project Report |

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#### Instructional Methods

- □ Learning Sprints®
- □ Course Book
- □ Vodcast
- □ Shortcast
- □ Audio
- □ Exam Template
- □ Review Book
- □ Creative Lab
- ☐ Guideline
- □ Live Tutorium/Course Feed

www.iu.org
# Business Consulting

**Module Code:** BWCN_E

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**Module Coordinator**

N.N. (Business Consulting I) / N.N. (Business Consulting II)

**Contributing Courses to Module**

- Business Consulting I (BWCN01_E)
- Business Consulting II (BWCN02_E)

**Module Exam Type**

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**Weight of Module**

see curriculum
Module Contents

**Business Consulting I**
- Introduction to Business Consulting
- Forms and Functions of Business Consulting
- The Market for Business Consulting
- History, pioneers and concepts
- Consulting fields

**Business Consulting II**
- Business Modell of Business Consulting
- Forms and Functions of Business Consulting
- Marketing of Consulting Services
- Consultant Liability, Contract Drafting and Professional Law
- The Consulting Project

**Learning Outcomes**

**Business Consulting I**
On successful completion, students will be able to
- understand the various definitions of business consulting.
- explain the tasks and approaches of business consultants.
- name the characteristics of business consultancies.
- explain business consulting as a highly specialized service.
- identify the specifics of the consultant-client relationship.

**Business Consulting II**
On successful completion, students will be able to
- explain the special framework conditions of consulting companies.
- identify the approaches in marketing for consulting services.
- explain the strategic and operational direction of consulting companies.
- understand the challenges of human resource management in consulting companies.
- explain the operational phases of the consulting process.

**Links to other Modules within the Study Program**
This module is similar to other modules in the field of Business Administration & Management

**Links to other Study Programs of IU International University of Applied Sciences**
All Bachelor Programs in the Business & Management field

www.iu.org
Course Description
Business consulting is a professional service whose overall economic significance is increasing. Business consultants provide professional consulting services for client companies. This requires the ability to analyze and evaluate specific corporate and market situations with the help of modern management concepts. Based on their analyses, business consultants make recommendations for optimizing corporate strategies, structures and processes and - if desired - accompany them during implementation and realization. In order to fulfill successfully the various functions and tasks of business consulting, business consultants require a differentiated profile of technical-methodical and personal-social competencies. The center of professional competencies is composed of basic and specialized knowledge in consulting and business administration. They include analytical skills for understanding corporate and market situations as well as the ability to plan, implement and control consulting projects. The development of personal and social competences aims at the client-centeredness of the students in the sense of the ability to adapt to the individual consulting needs of clients.

Course Outcomes
On successful completion, students will be able to
- understand the various definitions of business consulting.
- explain the tasks and approaches of business consultants.
- name the characteristics of business consultancies.
- explain business consulting as a highly specialized service.
- identify the specifics of the consultant-client relationship.

Contents
1. Introduction to Business Consulting
   1.1 Business Consulting - Management Consulting
   1.2 Business Consulting as a Subject of Science
2. Forms and Functions of Business Consulting
   2.1 Manifestations of Business Consulting
   2.2 Functions of Business Consulting
   2.3 Inhouse Consulting
3. The Market for Business Consulting
   3.1 Data, Structures and Trends
   3.2 Consulting Companies in Germany

4. History, Pioneers and Concepts
   4.1 History of Business Consulting
   4.2 Business Consulting Concepts

5. Consulting Fields
   5.1 Strategy Consulting
   5.2 Organization and Transformation Consulting
   5.3 IT Consulting
   5.4 Personnel Consulting/HR Consulting

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Business Consulting II
Course Code: BWCN02_E

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Course Description
Business consultants offer professional consulting services for client companies. The object of business consulting is therefore the acquisition, planning and implementation of business consulting projects. The content of these consulting projects is diverse and, depending on the task, can include aspects of strategic corporate management, challenges in the area of financing and cost reduction, the introduction of new technologies, working methods and systems, internal communication, restructuring, mergers/acquisitions or outsourcing of companies or individual company divisions. Consulting projects and consulting processes are characterized by recurring elements, the understanding and application of which significantly influence the success of a consulting service. The competence and quality of contract acquisition and project management is determined by the management of the consulting firm itself. Depending on the consulting philosophy, consulting concept, consulting organization and service marketing, success or failure is reached in consultant-client relationships. Participation in the course requires successful completion of the Business Consulting I course.

Course Outcomes
On successful completion, students will be able to
- explain the special framework conditions of consulting companies.
- identify the approaches in marketing for consulting services.
- explain the strategic and operational direction of consulting companies.
- understand the challenges of human resource management in consulting companies.
- explain the operational phases of the consulting process.

Contents
1. The Business Model of Business Consulting
   1.1 The Business Consultancy as a Professional Service Firm
   1.2 The Value Creation Model of Business Consulting
   1.3 The Market Environment of the Consulting Company

2. The Management of the Consultancy Company
   2.1 Fields of Action and Decision-Making for the Management of Business Consulting Companies
   2.2 Normative and Strategic Fields of Action and Decision-Making
   2.3 Personnel and HR Management in the Consulting Company
3. Marketing of Consulting Services
   3.1 Special Features of Service Marketing
   3.2 Strategic Marketing of Consulting Companies
   3.3 Operational Service Marketing of Consulting Companies
   3.4 Relationship Marketing of Consulting Companies

4. Consultant Liability, Contract Drafting and Professional Law
   4.1 Consultant Liability
   4.2 Contract Drafting
   4.3 Legal Issues of Professional Practice

5. The Consulting Project
   5.1 Requirements
   5.2 Settings and Techniques
   5.3 Consulting Phase

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcut
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed

www.iu.org
**Augmented, Mixed and Virtual Reality**  
*Module Code: DLBMIAMVR_E*

<table>
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**Module Coordinator**  
N.N. (Augmented, Mixed and Virtual Reality) / N.N. (X-Reality Project)

**Contributing Courses to Module**
- Augmented, Mixed and Virtual Reality (DLBMIAMVR01_E)
- X-Reality Project (DLBMIAMVR02_E)

**Module Exam Type**

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**Weight of Module**
see curriculum
Module Contents

Augmented, Mixed and Virtual Reality
- Definition and Differentiation of Terms
- Fields of Application and Examples
- Aspects of Human Perception
- Augmented and Virtual Reality Output Devices
- Input Devices
- Interaction in Virtual and Augmented Realities
- Aspects of XR Application Development
- Future of XR Technologies

X-Reality Project
Development of AR-/VR-Application; Design, Implementation and Documentation; Challenges and Problems

Learning Outcomes

Augmented, Mixed and Virtual Reality
On successful completion, students will be able to
- name the characteristics and differences of augmented, mixed, and virtual reality techniques.
- describe the importance of sensual perception in AR and VR.
- explain the basic technical features of AR and VR systems.
- explain the different interaction possibilities in AR and VR applications.
- perform selected development processes for AR and VR applications.

X-Reality Project
On successful completion, students will be able to
- implement a small AR/VR application by themselves.
- experiment with the concept of AR/VR applications.
- discuss challenges and issues in AR/VR software development.
- document the concept and implementation of independently developed AR/VR applications and accumulated experience in a project report.

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 IU International University of Applied Sciences
All Bachelor Programs in the IT & Technology fields

www.iu.org
Augmented, Mixed and Virtual Reality
Course Code: DLBMIAMVR01_E

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Course Description
Augmented, mixed and virtual reality (AR, MR and VR) technologies are becoming increasingly important in a wide range of application areas. In this context, novel hardware devices and forms of interaction are used. In addition to the technical foundations, this course covers aspects of human perception and approaches for developing AR/VR applications. To give the students a knowledge of the field, the terms augmented, mixed, and virtual reality will be defined and differentiated and examples of their use will be demonstrated. In order to simulate the existence of a virtual world or virtual objects to users, aspects of human perception have to be used. Based on the fundamentals of human information processing, the course highlights the phenomena, problems, and solutions that have to be considered in AR and VR applications. AR and VR systems can be implemented in different ways. This course addresses different output forms, tracking methods and interaction possibilities. In addition, other techniques that are specifically relevant in the AR field will be represented. Software development in the AR and VR field may require the application of special processes. This course teaches selected approaches that are helpful in designing, prototyping, and testing AR and VR applications. The course concludes with a view at the future applications and the research potential of augmented, mixed, and virtual reality.

Course Outcomes
On successful completion, students will be able to
- name the characteristics and differences of augmented, mixed, and virtual reality techniques.
- describe the importance of sensual perception in AR and VR.
- explain the basic technical features of AR and VR systems.
- explain the different interaction possibilities in AR and VR applications.
- perform selected development processes for AR and VR applications.

Contents
1. Introduction to Augmented, Mixed and Virtual Reality
   1.1 Definition and Differentiation of Terms
   1.2 Fields of Application and Examples
2. Aspects of Human Perception
   2.1 Human Information Processing
   2.2 Visual Perception
   2.3 Multisensory Perception
   2.4 Phenomena, Problems and Solutions

3. Virtual Reality Output Devices
   3.1 Mounts for Smartphones
   3.2 Simple 3-Degrees-of-Freedom VR Glasses
   3.3 6-Degrees-of-Freedom-VR
   3.4 Multisensor Technology

4. Augmented Reality Output Devices
   4.1 Tracking
   4.2 Video See-Through vs. Optical See-Through vs. Projection
   4.3 General Differences between Devices

5. Input Devices
   5.1 Controller and Other Devices
   5.2 Touchpads
   5.3 Voice Commands
   5.4 Finger Tracking
   5.5 Eye Tracking
   5.6 Neurofeedback

6. Interaction in Virtual and Augmented Realities
   6.1 Fundamentals of Human-Computer Interaction
   6.2 Selection
   6.3 Manipulation of Objects
   6.4 Navigation
   6.5 Perceptual Variables

7. Aspects of Development
   7.1 Iterative Development Approaches for VR/AR Applications
   7.2 Design Techniques
   7.3 Prototyping
   7.4 Evaluation
8. The Future of Augmented, Mixed and Virtual Reality
   8.1 Outlook on Future Applications
   8.2 Focus Points for Future Research

Literature

Compulsory Reading

Further Reading

### Study Format Distance Learning

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### Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
- ☐ Vodcast
- ☐ Shortcast
- ☐ Audio
- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed
X-Reality Project
Course Code: DLBMIAMVR02_E

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Course Description
The students create an application from the field of augmented or virtual reality by themselves and document its conception and implementation as well as collected experiences. The development of an AR/VR application may include special steps that are not known from classic software applications. In this context, AR- or VR-typical elements of the application should be explicitly highlighted and challenges and problems should be addressed.

Course Outcomes
On successful completion, students will be able to
- implement a small AR/VR application by themselves.
- experiment with the concept of AR/VR applications.
- discuss challenges and issues in AR/VR software development.
- document the concept and implementation of independently developed AR/VR applications and accumulated experience in a project report.

Contents
- The students work on a project from the field of augmented or virtual reality. They design and implement an AR/VR application based on a concrete task. The development of the application as well as collected experiences are documented in a project report. The project report first presents the project goal as well as the topic and context of the application. Then the requirements, the conception and the implementation of the application are described. During the documentation, AR- or VR-typical elements will be explicitly highlighted. The report concludes by highlighting the challenges and issues that arose during development.

Literature

Compulsory Reading

Further Reading
### Study Format Distance Learning

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### Instructional Methods

- [ ] Learning Sprints®
- [ ] Course Book
- [ ] Vodcast
- [ ] Shortcast
- [ ] Audio
- [ ] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [ ] Live Tutorium/Course Feed

www.iu.org
# Digital Business

**Module Code:** DLBBWWDM_E

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**Module Coordinator**

Prof. Dr. Mario Boßlau (Digital Business Models) / N.N. (Project: Design Thinking)

**Contributing Courses to Module**

- Digital Business Models (DLBLODB01_E)
- Project: Design Thinking (DLBINGDT01_E)

**Module Exam Type**

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<thead>
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<th>Module Exam</th>
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<tr>
<td>Project: Design Thinking</td>
<td><strong>Project: Design Thinking</strong></td>
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## Weight of Module

see curriculum

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**Digital Business Models** is a module that offers a comprehensive study of digital business models, focusing on both theoretical concepts and practical applications. The module is designed for students pursuing a Business Administration degree, with CP 10 credit points.

The module requires no admission requirements and spans a minimum of 1 semester. It is regularly offered in the Winter and Summer Semesters (WiSe/SoSe).

The module is taught in English by Prof. Dr. Mario Boßlau and N.N., focusing on the integration of theoretical knowledge with practical design thinking.

The contributing courses include **Digital Business Models (DLBLODB01_E)** and **Project: Design Thinking (DLBINGDT01_E)**, each offering a blend of lecture and project-based learning.

**Module Exam Type**

- **Module Exam**: The exam format varies by study format:
  - **Distance Learning**: Exam, 90 minutes
  - **myStudies**: Exam, 90 minutes
- **Split Exam**:
  - **Digital Business Models**: Written Assessment: Project Report
  - **Project: Design Thinking**: Written Assessment: Project Report

For more information, visit the IU website at [www.iu.org](http://www.iu.org).

---
Module Contents

Digital Business Models
- Meaning, Origin and Definition of the Term "Digital Business Model"
- Basic Concepts for the Description of Business Models
- Tools for the Description of Business Models
- Patterns of Digital Business Models
- Digital Business Models and Business Plans

Project: Design Thinking
- Basic Principles of Design Thinking
- The Design Thinking Micro Process
- The Design Thinking Macro Process
- Methods for Early Phases of the Process
- Methods for idea Generation
- Methods for Prototyping and Testing
- Space Concepts for Design Thinking
- Examples and Case Studies

Learning Outcomes

Digital Business Models
On successful completion, students will be able to
- understand what a business model is and how to describe it systematically.
- outline the basic features of the historical development of business models.
- describe key digital business models and evaluate their advantages and disadvantages.
- establish the relationship between a business model and a business plan to independently derive and analyse the positioning of a company.

Project: Design Thinking
On successful completion, students will be able to
- know the mindset of Design Thinking.
- know the individual phases of the incremental micro cycle and carry them out on an example project.
- know the individual stages of prototyping and apply them in an example project.
- know and use methods and tools for the individual steps of the micro cycle.
- know different space concepts for Design Thinking work environments.
- know examples for the application of Design Thinking by means of business case studies.

Links to other Modules within the Study Program
This module is similar to other modules in the fields of Business Administration & Management and Design.

Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programmes in the Business & Management and Design, Architecture & Construction fields.
Digital Business Models

Course Code: DLBLODB01_E

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Course Description
A business model contains the depiction of the logic of how a company generates, delivers and secures value. The progressing digitalization of many processes, products and services has made possible a large number of innovations in the area of business models in recent years. The subject of this course rounds up the presentation, the underlying patterns and the main factors that influence these digital business models. Starting from a general definition of the concept of a business model, a system is developed to describe the essential factors of a business model. An overview of the historical development of important business models and in particular the influence of digitization on newer business models allows a classification of the concept and an understanding of the framework. Then the most important alternative digital business models of recent years are systematically presented, analyzed and evaluated with regard to their respective strengths and weaknesses. Finally, the role of business models in the creation process of a business plan is described. Students learn the central approaches to developing an independent corporate positioning and are enabled to examine and evaluate the central factors influencing corporate success in digital business.

Course Outcomes
On successful completion, students will be able to
- understand what a business model is and how to describe it systematically.
- outline the basic features of the historical development of business models.
- describe key digital business models and evaluate their advantages and disadvantages.
- establish the relationship between a business model and a business plan to independently derive and analyse the positioning of a company.

Contents
1. Meaning, Origin and Definition of the Term "Digital Business Model
   1.1 Goals and Functions of Digital Business Models
   1.2 Business Model - Origin of the Term and its Meaning in the Digital Economy
   1.3 Definition of the terms Business Model and Digital Business Model
   1.4 Differentiation from Other Terminologies of the Digital Economy
2. Basic Concepts for the Description of Business Models
   2.1 Value Chain
   2.2 Value Chains
   2.3 Dominant Logic
   2.4 Revenue Model
   2.5 Unique Selling Proposition
   2.6 Transaction
   2.7 Product or Service Range

3. Tools for the Description of Business Models
   3.1 Business Model Canvas
   3.2 St. Gallen Business Model Navigator
   3.3 DVC Framework

4. Patterns of Digital Business Models
   4.1 Long Tail
   4.2 Multi-Sided Pattern
   4.3 Free and Freemium
   4.4 OPEN API Pattern

5. Digital Business Models and Business Plans
   5.1 Integration of the Business Model into the Business Plan
   5.2 Company Positioning and the Digital Business Model
   5.3 Digital Business Models as Innovation Drivers for the Development of New Businesses

Literature

Compulsory Reading

Further Reading
# Study Format Distance Learning

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
### Study Format myStudies

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### Instructional Methods

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- Live Tutorium/Course Feed
Project: Design Thinking

Course Code: DLBINGDT01_E

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Course Description
In this course students will receive a practical introduction to Design Thinking. In addition to teaching the individual basic principles, the procedures in Design Thinking will also be examined in detail. In order not only to understand Design Thinking but also to experience it, selected methods for the individual process steps will be presented and practiced on an example project.

Course Outcomes
On successful completion, students will be able to
- know the mindset of Design Thinking.
- know the individual phases of the incremental micro cycle and carry them out on an example project.
- know the individual stages of prototyping and apply them in an example project.
- know and use methods and tools for the individual steps of the micro cycle.
- know different space concepts for Design Thinking work environments.
- know examples for the application of Design Thinking by means of business case studies.

Contents
1. Basic Principles of Design Thinking
2. The Design Thinking Micro Process
3. The Design Thinking Macro Process
4. Methods for Early Phases of the Process
5. Methods for Idea Generation
6. Methods for Prototyping and Testing
7. Examples and Case Studies
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<td>▪ Lewrick, M./Patrick, L./Leifer, L. (2018): The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems. JOHN WILEY &amp; Sons, Hoboken, NJ.</td>
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| Type of Exam                        | Written Assessment: Project Report |

## Student Workload

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## Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
- ☐ Vodcast
- ☐ Shortcast
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- ☐ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☐ Live Tutorium/Course Feed
### Study Format myStudies

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### Instructional Methods

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- Guideline
- Live Tutorium/Course Feed
# Infrastructure and Operations

**Module Code:** DLBSEWIO_E

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**Module Coordinator**

Prof. Dr. Marian Benner-Wickner (IT Operations Management) / N.N. (Project: IT Service Management)

**Contributing Courses to Module**

- IT Operations Management (DLBSEWIO01_E)
- Project: IT Service Management (DLBCSPITSM01)

**Module Exam Type**

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**Weight of Module**

see curriculum
Module Contents

IT Operations Management
- Foundations of IT Infrastructure
- IT Service Management
- IT Operations Management
- Cloud Operations
- A Modern Approach to IT Operations Management: DevOps

Project: IT Service Management
All phases of an ITIL/IT project are carried out as part of an independent project.

Learning Outcomes

IT Operations Management
On successful completion, students will be able to
- describe the elements of a company’s IT infrastructure.
- use IT service management standards and frameworks to organize a company’s IT infrastructure.
- name and describe certain aspects of IT operations management, such as monitoring, security management and virtualization.
- select and use an appropriate cloud infrastructure for a given scenario and to name critical aspects in cloud operations.
- to use DevOps as a modern approach to IT operations management.

Project: IT Service Management
On successful completion, students will be able to
- analyze typical problems and company situations from the area of IT service management in different project variations.
- develop, plan, and implement proposed solutions.
- convert theory into a pragmatic approach to a solution with the help of methodical tools from IT service management and project management.
- draw and apply the right conclusions in relation to their specific project environment.
- conceptually apply their theoretical knowledge to company-specific environmental factors.

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 IU International University of Applied Sciences
All Bachelor Programs in the IT & Technology field
Course Description
The course introduces the topic of IT Operations Management to students. It addresses how to operate and maintain a company’s IT infrastructure. Therefore, students will learn about the foundations of IT infrastructure and how to organize the outcome of the IT service department into IT services. Selected aspects of IT operations management, such as monitoring, security management, and virtualization will be addressed. Furthermore, cloud operations as well as the DevOps approach will be explained in detail.

Course Outcomes
On successful completion, students will be able to

- describe the elements of a company’s IT infrastructure.
- use IT service management standards and frameworks to organize a company’s IT infrastructure.
- name and describe certain aspects of IT operations management, such as monitoring, security management and virtualization.
- select and use an appropriate cloud infrastructure for a given scenario and to name critical aspects in cloud operations.
- to use DevOps as a modern approach to IT operations management.

Contents
1. Foundations of IT Infrastructure
   1.1 Hardware
   1.2 Software
   1.3 Networks and Distributed Systems
   1.4 Data Center
   1.5 Enterprise Information Technology

2. IT Service Management
   2.1 Overview on IT Service Management
   2.2 The ISO/IEC 20000 Standard
   2.3 The ITIL Framework
   2.4 The FitSM Framework
3. IT Operations Management
   3.1 Deployment
   3.2 Monitoring
   3.3 Event Management
   3.4 Availability Management
   3.5 Security Management
   3.6 Recovery Management
   3.7 Virtualization & Containers

4. Cloud Operations
   4.1 On-premises vs. Cloud Operations
   4.2 Cloud Operation Models
   4.3 Hardware and Software Architectures for Cloud Operations
   4.4 Infrastructure as Code
   4.5 Cloud & Compliance: Security, Data Privacy, and Licensing
   4.6 Vendor Management: Contracts and Service Levels

5. A Modern Approach to IT Operations Management: DevOps
   5.1 People, Organization and Processes
   5.2 Agility and Continuous Delivery
   5.3 Automation in IT Operations
   5.4 Basic Principles of DevOps
   5.5 Ways of Implementing DevOps

6. Summary and Outlook
   6.1 IT Operations in a Nutshell
   6.2 Future Developments in the Field
   6.3 Job Profiles in IT Operations
### Literature

**Compulsory Reading**

**Further Reading**

**Study Format Distance Learning**

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**Student Workload**

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**Instructional Methods**

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- ☐ Vodcast
- ☑ Shortcast
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- ☑ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Live Tutorium/Course Feed
Project: IT Service Management

Course Code: DLBCSPITSM01

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Course Description

Based on the contents of the course "IT Service Management", selected aspects of the core processes of ITIL are deepened, discussed, selected, and applied within the framework of a project in a concept-related manner. All theoretical methods are considered and evaluated.

Course Outcomes

On successful completion, students will be able to

- analyze typical problems and company situations from the area of IT service management in different project variations.
- develop, plan, and implement proposed solutions.
- convert theory into a pragmatic approach to a solution with the help of methodical tools from IT service management and project management.
- draw and apply the right conclusions in relation to their specific project environment.
- conceptually apply their theoretical knowledge to company-specific environmental factors.

Contents

- Analysis, evaluation, and development of recommendations for taking action within the scope of concrete questions concerning aspects of IT Service Management. This is aided by the creation and planning of a project in the theoretical-theme context through all phases of project management.
- The quality assurance of the artefacts created is carried out both by the tutor and by students from the project groups.

Literature

**Compulsory Reading**

**Further Reading**

## Study Format Distance Learning

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### Instructional Methods

- ✔️ Learning Sprints®
- ☐ Course Book
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# Study Format myStudies

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| Type of Exam                       | Written Assessment: Project Report |

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## Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template

- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
## Data Engineer

**Module Code:** DLBDSEDE

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### Module Coordinator

N.N. (Data Engineering) / N.N. (Project: Data Engineering)

### Contributing Courses to Module

- Data Engineering (DLBDSEDE01)
- Project: Data Engineering (DLBDSEDE02)

### Module Exam Type

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### Weight of Module

see curriculum
### Module Contents

**Data Engineering**
- understand important foundational concepts in data engineering.
- recognize established and commonly-employed NoSQL datastores and their salient characteristics.
- comprehend common architectural patterns for data processing at scale.
- explain the concept of containerization as a virtualization approach.
- analyze operational challenges in the set-up and maintenance of data pipelines.
- demonstrate familiarity with concepts relating to data security and protection.

**Project: Data Engineering**
- formulate and implement a real-world data engineering use case.
- select appropriate resources for the task at hand.
- transfer acquired specialized knowledge in data engineering to a real-world use case.
- derive relevant design choices from the given project setting.
- analyze the suitability of different solution options with respect to the project task.
- make apposite choices with respect to implementation alternatives.

### Learning Outcomes

**Data Engineering**
On successful completion, students will be able to
- understand important foundational concepts in data engineering.
- recognize established and commonly-employed NoSQL datastores and their salient characteristics.
- comprehend common architectural patterns for data processing at scale.
- explain the concept of containerization as a virtualization approach.
- analyze operational challenges in the set-up and maintenance of data pipelines.
- demonstrate familiarity with concepts relating to data security and protection.

**Project: Data Engineering**
On successful completion, students will be able to
- formulate and implement a real-world data engineering use case.
- select appropriate resources for the task at hand.
- transfer acquired specialized knowledge in data engineering to a real-world use case.
- derive relevant design choices from the given project setting.
- analyze the suitability of different solution options with respect to the project task.
- make apposite choices with respect to implementation alternatives.

### Links to other Modules within the Study Program

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

### Links to other Study Programs of IU International University of Applied Sciences

All Bachelor Programmes in the IT & Technology field(s).
## Data Engineering

### Course Description
This course explores concepts of data engineering. Data engineering is concerned with the infrastructure aspects of data science such as data storage and provision, as well as the provisioning of suitable operational environments. After laying out foundational notions and concepts of the discipline, this course addresses important developments in storage technology; aspects of systems architecture for processing data at scale; containerization as a modern take on virtualization; and the logic of data pipelines and associated operational aspects. Important issues pertaining to data security and protection are also given appropriate attention.

### Course Outcomes
On successful completion, students will be able to

- understand important foundational concepts in data engineering.
- recognize established and commonly-employed NoSQL datastores and their salient characteristics.
- comprehend common architectural patterns for data processing at scale.
- explain the concept of containerization as a virtualization approach.
- analyze operational challenges in the set-up and maintenance of data pipelines.
- demonstrate familiarity with concepts relating to data security and protection.

### Contents

1. **Foundations of Data Engineering**
   1.1 Reliability
   1.2 Scalability
   1.3 Maintainability

2. **NoSQL In Depth**
   2.1 Fundamentals of NoSQL
   2.2 Established NoSQL solutions

3. **Architectures for Data Processing at Scale**
   3.1 Batch processing architectures
   3.2 Architectures for stream and complex event processing
   3.3 Lambda architecture
## Literature

### Compulsory Reading

### Further Reading

### Study Format Distance Learning

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| Type of Exam | Exam, 90 Minutes |

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
Project: Data Engineering

Course Code: DLBSEDE02

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Course Description
The focus of this course is the implementation of a real-world data engineering use case in the form of a student portfolio. To this end, students choose a project subject from the various sub-domains of data engineering. Examples include setting up a Docker container environment or dockerized service; implementing a data pipeline according to DataOps principles; and setting up an NoSQL data store. The goal is for students to demonstrate they can transfer theoretical knowledge to an implementation scenario that closely mimics practical work in a professional data engineering setting.

Course Outcomes
On successful completion, students will be able to
- formulate and implement a real-world data engineering use case.
- select appropriate resources for the task at hand.
- transfer acquired specialized knowledge in data engineering to a real-world use case.
- derive relevant design choices from the given project setting.
- analyze the suitability of different solution options with respect to the project task.
- make apposite choices with respect to implementation alternatives.

Contents
- This course covers the practical implementation of approaches and techniques covered in the preceding methodological course in a project-oriented setting. Each participant must produce a portfolio detailing and documenting the work. Portfolio themes are chosen from a list, or suggested by the students in accord with the tutor.
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### Student Workload

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### Instructional Methods

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- ☐ Course Book
- ☐ Vodcast
- ☐ Shortcast
- ☐ Audio
- ☐ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed
User Experience
Module Code: DLBMIUEX_E

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Module Coordinator
Prof. Dr. Katharina Bredies (User Experience) / N.N. (UX-Project)

Contributing Courses to Module
- User Experience (DLBMIUX01_E)
- UX-Project (DLBMIUX02_E)

Module Exam Type

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Weight of Module
see curriculum
Module Contents

User Experience
- Basics of User Experience
- Customer Journey
- Selected UX Techniques
- UX Evaluation
- Information Design
- UX on a Large Scale

UX-Project
Practical project with focus on UX.

Learning Outcomes

User Experience
On successful completion, students will be able to
- describe, classify, and delimit the term user experience and its concepts.
- analyze touchpoints, create customer journey maps and describe personas.
- describe suitable techniques for user experience design and select them for a specific task.
- describe techniques for evaluating UX and identify appropriate ones for specific tasks.
- describe and delimit selected techniques for information design.
- describe and delimit concepts and approaches for designing user experience at the process, service and enterprise levels.
- engage in interdisciplinary team work and communicate comprehensively with UX professionals with complementary backgrounds and skill sets.

UX-Project
On successful completion, students will be able to
- independently carry out small and medium-sized project tasks in the field of UX and produce an appropriate result.
- define a suitable approach to UX projects and identify appropriate techniques and methods specifically.
- critically reflect and document the work process and the achieved result regarding the target achievement.

Links to other Modules within the Study Program
This module is similar to other modules in the field of Design

Links to other Study Programs of IU International University of Applied Sciences
All Bachelor Programs in the Design, Architecture & Construction fields
User Experience
Course Code: DLBMIUX01_E

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Course Description
The term user experience (UX) generally refers to the experience that users and customers have in relationship to the products and services that a company offers. It is not only about improving the usability of IT systems, but also about analyzing, designing and evaluating the experience of users and customers. After an introduction to the topic of user experience, some methods for analyzing the user experience will be explained and their application will be discussed. Then, selected techniques for designing user experience and suitable approaches to information design are introduced. After that specific techniques for evaluating UX are discussed. Finally, it will be explained how UX can be designed specifically at the level of services and companies.

Course Outcomes
On successful completion, students will be able to

- describe, classify, and delimit the term user experience and its concepts.
- analyze touchpoints, create customer journey maps and describe personas.
- describe suitable techniques for user experience design and select them for a specific task.
- describe techniques for evaluating UX and identify appropriate ones for specific tasks.
- describe and delimit selected techniques for information design.
- describe and delimit concepts and approaches for designing user experience at the process, service and enterprise levels.
- engage in interdisciplinary team work and communicate comprehensively with UX professionals with complementary backgrounds and skill sets.

Contents
1. UX Basics
   1.1 Terms, Concepts, History
   1.2 User Experience Design and Management
   1.3 Selected Scenarios from Practice

2. Analysis
   2.1 Contextual Inquiry
   2.2 Touchpoint Analysis
   2.3 Customer Journey Map
   2.4 Persona
3. Finding Ideas
   3.1 Use Cases
   3.2 User Stories
   3.3 Storyboards

4. Design and Prototyping
   4.1 The Human Perception
   4.2 Card Sorting
   4.3 Sketches and Scribbles
   4.4 Wireframes
   4.5 Prototyping
   4.6 Guidelines and Style Guides

5. Evaluation
   5.1 Usability Testing
   5.2 Observation Techniques
   5.3 Interview Techniques and Questionnaires

6. "UX on a Large Scale"
   6.1 UX in Services and Business Processes
   6.2 Corporate UX
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<td>▪ Garrett, Jesse</td>
<td>James. The Elements of User Experience : User-Centered Design for the Web and</td>
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<td>▪ Kuniavsky, Mike,</td>
<td>Andrea Moed, and Elizabeth Goodman. Observing the User Experience [Electronic</td>
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<td>Resource] : A Practitioner’s Guide to User Research. Waltham, MA Morgan Kaufmann,</td>
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<td>▪ Norman, Don.</td>
<td>The Design of Everyday Things : Revised and Expanded Edition. Vol. Revised and</td>
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<td>▪ Saul, Greenberg,</td>
<td>Carpendale Sheelagh, Marquardt Nicolai, and Buxton Bill. Sketching User Experiences:</td>
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<td>Amsterdam [u.a.]: Elsevier MK, 2013. Monograph.</td>
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<td>▪ Robier, Johannes.</td>
<td>“Ux Redefined. Winning and Keeping Customers with Enhanced Usability and User</td>
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### Study Format Distance Learning

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### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed
UX-Project  
Course Code: DLBMIUEX02_E

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**Course Description**

The aim of the module is to apply the already acquired knowledge and skills on the subject of User Experience in a practical project. The students work on a self-organized project with focus on User Experience.

**Course Outcomes**

On successful completion, students will be able to

- independently carry out small and medium-sized project tasks in the field of UX and produce an appropriate result.
- define a suitable approach to UX projects and identify appropriate techniques and methods specifically.
- critically reflect and document the work process and the achieved result regarding the target achievement.

**Contents**

- The knowledge acquired in the course User Experience is applied to projects. The approach, the results achieved and the critical reflection are documented in a written project report.

**Literature**

**Compulsory Reading**

**Further Reading**

### Study Format Distance Learning

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| Type of Exam | Written Assessment: Project Report |

#### Student Workload

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#### Instructional Methods

- ☐ Learning Sprints®
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- ☐ Vodcast
- ☐ Shortcast
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- ☐ Exam Template
- ☐ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☑ Guideline
- ☐ Live Tutorium/Course Feed

www.iu.org
## AI Specialist
**Module Code:** DLBDSEAIS

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<td>English</td>
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### Module Coordinator
Prof. Dr. Ulrich Kerzel (Artificial Intelligence) / N.N. (Project: Artificial Intelligence)

### Contributing Courses to Module
- Artificial Intelligence (DLBDSEAIS01)
- Project: Artificial Intelligence (DLBDSEAIS02)

### Module Exam Type

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### Weight of Module
see curriculum
Module Contents

Artificial Intelligence

- chart the historical developments in artificial intelligence.
- understand the approach of contemporary AI systems.
- comprehend the concepts behind reinforcement learning.
- analyze natural language using basic NLP techniques.
- scrutinize images and their contents.

Project: Artificial Intelligence

- determine the requirements for building an artificial intelligence system.
- evaluate an application for an AI system.
- transfer theoretically-sound and practically-proven methods and tools to an application domain.
- create an AI system for a chosen application.

Learning Outcomes

Artificial Intelligence

On successful completion, students will be able to

- chart the historical developments in artificial intelligence.
- understand the approach of contemporary AI systems.
- comprehend the concepts behind reinforcement learning.
- analyze natural language using basic NLP techniques.
- scrutinize images and their contents.

Project: Artificial Intelligence

On successful completion, students will be able to

- determine the requirements for building an artificial intelligence system.
- evaluate an application for an AI system.
- transfer theoretically-sound and practically-proven methods and tools to an application domain.
- create an AI system for a chosen application.

Links to other Modules within the Study Program

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

Links to other Study Programs of IU

International University of Applied Sciences

All Bachelor Programmes in the IT & Technology fields
Artificial Intelligence
Course Code: DLBDSEAIS01

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Course Description
The quest for artificial intelligence (AI) 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 modern approaches in the development of artificial intelligence. This course gives an introduction to reinforcement learning, a process similar to how humans and animals experience the world: exploring the environment and inferring the best course of action. This course also covers the principles of natural language processing and computer vision, both of which are key ingredients for an artificial intelligence to be able to interact with its environment.

Course Outcomes
On successful completion, students will be able to
- chart the historical developments in artificial intelligence.
- understand the approach of contemporary AI systems.
- comprehend the concepts behind reinforcement learning.
- analyze natural language using basic NLP techniques.
- scrutinize images and their contents.

Contents
1. History of AI
   1.1 Historical developments
   1.2 AI winter
   1.3 Expert systems
   1.4 Notable advances
2. Modern AI Systems
   2.1 Narrow versus general AI
   2.2 Application areas
3. Reinforcement Learning
   3.1 What is reinforcement learning?
   3.2 Markov Chains and value function
   3.3 Time-difference and Q Learning
4. Natural Language Processing (NLP)
   4.1 Introduction to NLP and application areas
   4.2 Basic NLP techniques
   4.3 Vectorizing data

5. Computer Vision
   5.1 Pixels and filters
   5.2 Feature detection
   5.3 Distortions and calibration
   5.4 Semantic segmentation

Literature

Compulsory Reading

Further Reading

# Study Format Distance Learning

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## Student Workload

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<th>Tutorial</th>
<th>Self Test</th>
<th>Practical Experience</th>
<th>Hours Total</th>
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<tbody>
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## Instructional Methods

- [ ] Learning Sprints®
- ✔ Course Book
- [ ] Vodcast
- ✔ Shortcast
- ✔ Audio
- ✔ Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- ✔ Live Tutorium/Course Feed
Project: Artificial Intelligence
Course Code: DLBDSEAIS02

<table>
<thead>
<tr>
<th>Study Level</th>
<th>Language of Instruction</th>
<th>Contact Hours</th>
<th>CP</th>
<th>Admission Requirements</th>
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<tbody>
<tr>
<td>BA</td>
<td>English</td>
<td>5</td>
<td></td>
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</tbody>
</table>

Course Description
This project course will give students hands-on experience in the challenging task of designing and developing an AI system for a specific application and domain. Students will need to consider requirements and practical constraints as well as the desired output of the AI system. Following this course the students will get holistic overview of developing a specific AI-based application.

Course Outcomes
On successful completion, students will be able to

- determine the requirements for building an artificial intelligence system.
- evaluate an application for an AI system.
- transfer theoretically-sound and practically-proven methods and tools to an application domain.
- create an AI system for a chosen application.

Contents
- This project course focuses on understanding and implementing a simple AI system. Based on the course Artificial Intelligence (DLBDSEAI01), students will design and implement a simple AI system. In the first step, students will choose a specific application and domain and then use the methods from the course to analyze the requirements and outcomes before implementing their own AI application. All relevant artifacts and considerations are documented by the students in a course portfolio.
<table>
<thead>
<tr>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory Reading</td>
</tr>
<tr>
<td>Further Reading</td>
</tr>
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</table>
### Study Format Fernstudium

<table>
<thead>
<tr>
<th>Study Format</th>
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<tr>
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### Information about the examination

<table>
<thead>
<tr>
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| Type of Exam | Portfolio |

### Student Workload

<table>
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<tr>
<th>Self Study</th>
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### Instructional Methods

- □ Learning Sprints®
- □ Course Book
- □ Vodcast
- □ Shortcast
- □ Audio
- □ Exam Template
- □ Review Book
- □ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed

www.iu.org
### Studium Generale

**Module Code:** DLBSG_E

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Admission Requirements</th>
<th>Study Level</th>
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<th>Student Workload</th>
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<th>Duration</th>
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<th>Language of Instruction</th>
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<tbody>
<tr>
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<td>Minimum 1 semester</td>
<td>WiSe/SoSe</td>
<td>English</td>
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</table>

**Module Coordinator**

N.N. (Studium Generale I) / N.N. (Studium Generale II)

**Contributing Courses to Module**

- Studium Generale I (DLBSG01_E)
- Studium Generale II (DLBSG02_E)

**Module Exam Type**

<table>
<thead>
<tr>
<th>Module Exam</th>
<th>Split Exam</th>
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<tbody>
<tr>
<td></td>
<td>Studium Generale I</td>
</tr>
<tr>
<td></td>
<td>Studium Generale II</td>
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</tbody>
</table>

**Weight of Module**

see curriculum
Module Contents

Studium Generale I
In principle, all IU bachelor courses can be selected as courses for the "Studium Generale", so that the content can be chosen from the entire breadth of the IU distance learning program.

Studium Generale II
In principle, all IU bachelor courses can be selected as courses for the "Studium Generale", so that the content can be chosen from the entire breadth of the IU distance learning program.

Learning Outcomes

Studium Generale I
On successful completion, students will be able to
- apply acquired key competencies to issues in their field of study and/or in their professional environment.
- to deepen one's own skills and abilities in a self-directed manner.
- to look beyond the boundaries of their own area of expertise.

Studium Generale II
On successful completion, students will be able to
- apply acquired key competencies to issues in their field of study and/or in their professional environment.
- to deepen one's own skills and abilities in a self-directed manner.
- to look beyond the boundaries of their own area of expertise.

Links to other Modules within the Study Program
It is a stand-alone offering with possible references to various required and elective modules

Links to other Study Programs of IU International University of Applied Sciences
All IU Distance Learning Bachelor Programs
Studium Generale I
Course Code: DLBSG01_E

<table>
<thead>
<tr>
<th>Study Level</th>
<th>Language of Instruction</th>
<th>CP</th>
<th>Admission Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA</td>
<td>English</td>
<td>5</td>
<td>None</td>
</tr>
</tbody>
</table>

Course Description
In the course "Studium Generale I", students deepen their knowledge in a self-selected subject area by completing an IU course outside their applicable curriculum. This gives them the opportunity to look beyond their own subject area and acquire further competencies. The associated option enables students to self-determine their study content to focus even more on issues relevant to them and/or to strengthen or develop selected competencies.

Course Outcomes
On successful completion, students will be able to
- apply acquired key competencies to issues in their field of study and/or in their professional environment.
- to deepen one's own skills and abilities in a self-directed manner.
- to look beyond the boundaries of their own area of expertise.

Contents
- The course "Studium Generale I" offers students the opportunity to take courses outside of their curriculum and the result can be credited as an elective subject. In principle, all IU bachelor courses that fulfill the following requirements can be chosen for this purpose:
  - They are not part of an integral part of the applicable mandatory curriculum.
  - They do not have admission requirements or students can prove that they have met the admission requirement.
  - The examination of the selected courses must be taken in full and finally passed in order to be credited as part of the 'Studium Generale'.

Literature

Compulsory Reading

Further Reading
- See course description of the selected course
Studium Generale II
Course Code: DLBSG02_E

<table>
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<th>Study Level</th>
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<tr>
<td>BA</td>
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<td>None</td>
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</tbody>
</table>

Course Description
In the course “Studium Generale II”, students deepen their knowledge in a self-selected subject area by completing an IU course outside their applicable curriculum. This gives them the opportunity to look beyond their own subject area and acquire further competencies. The associated option enables students to self-determine their study content to focus even more on issues relevant to them and/or to strengthen or develop selected competencies.

Course Outcomes
On successful completion, students will be able to

- apply acquired key competencies to issues in their field of study and/or in their professional environment.
- to deepen one’s own skills and abilities in a self-directed manner.
- to look beyond the boundaries of their own area of expertise.

Contents
- The course “Studium Generale II” offers students the opportunity to take courses outside of their curriculum and the result can be credited as an elective subject. In principle, all IU bachelor courses that fulfill the following requirements can be chosen for this purpose:
  - They are not part of an integral part of the applicable mandatory curriculum.
  - They do not have admission requirements or students can prove that they have met the admission requirement.
  - The examination of the selected courses must be taken in full and finally passed in order to be credited as part of the ‘Studium Generale’.

Literature

Compulsory Reading

Further Reading
- See course description of the selected course
# Bachelor Thesis

**Module Code:** DLBBT

<table>
<thead>
<tr>
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<th>Admission Requirements</th>
<th>Study Level</th>
<th>CP</th>
<th>Student Workload</th>
</tr>
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<tbody>
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<td>BA</td>
<td>10</td>
<td>300 h</td>
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<table>
<thead>
<tr>
<th>Semester / Term</th>
<th>Duration</th>
<th>Regularly offered in</th>
<th>Language of Instruction</th>
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</thead>
<tbody>
<tr>
<td>see curriculum</td>
<td>Minimum 1 semester</td>
<td>WiSe/SoSe</td>
<td>English</td>
</tr>
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</table>

**Module Coordinator**

Degree Program Advisor (SGL) (Bachelor Thesis) / Degree Program Advisor (SGL) (Colloquium)

**Contributing Courses to Module**

- Bachelor Thesis (DLBBT01)
- Colloquium (DLBBT02)

**Module Exam Type**

<table>
<thead>
<tr>
<th>Module Exam</th>
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<tr>
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<td>Bachelor Thesis</td>
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<td>- Study Format &quot;myStudies&quot;: Written Assessment: Bachelor Thesis</td>
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<tr>
<td></td>
<td>- Study Format &quot;Distance Learning&quot;: Written Assessment: Bachelor Thesis</td>
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<td>Colloquium</td>
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<tr>
<td></td>
<td>- Study Format &quot;myStudies&quot;: Presentation: Colloquium</td>
</tr>
<tr>
<td></td>
<td>- Study Format &quot;Distance Learning&quot;: Presentation: Colloquium</td>
</tr>
</tbody>
</table>

**Weight of Module**

see curriculum
Module Contents

Bachelor Thesis
- Bachelor's thesis
- Colloquium on the bachelor's thesis

Colloquium

Learning Outcomes

Bachelor 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.
- independently analyze selected tasks with scientific methods, critically evaluate them, and develop appropriate solutions under the guidance of an academic supervisor.
- record and analyze existing (research) literature appropriate to the topic of their bachelor'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 using academic presentation and communication techniques.
- reflect on the scientific and methodological approach chosen in their bachelor's thesis.
- demonstrate that they can actively answer subject-related questions from the subject experts (reviewers of the bachelor’s thesis).

Links to other Modules within the Study Program
- All modules in the bachelor program

Links to other Study Programs of IU International University of Applied Sciences
- All bachelor programs in distance learning

www.iu.org
Bachelor Thesis
Course Code: DLBBT01

Study Level | Language of Instruction | Contact Hours | CP | Admission Requirements
---|---|---|---|---
BA | English | 9 | none

Course Description
The aim and purpose of the bachelor'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 bachelor's thesis can be a practical-empirical or theoretical-scientific problem. Students should prove that they can independently analyze 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 chosen by the student from their respective field of study should meet the acquired scientific competences, deepening their academic knowledge and skills in order to meet the future needs of the field.

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.
- independently analyze selected tasks with scientific methods, critically evaluate them, and develop appropriate solutions under the guidance of an academic supervisor.
- record and analyze existing (research) literature appropriate to the topic of their bachelor's thesis.
- prepare a detailed written elaboration in compliance with scientific methods.

Contents
- The bachelor's thesis must be written on a topic that relates to the content of the respective major field of study. In the context of the bachelor'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 their ability to use the acquired knowledge theoretically and/or empirically in the form of an independent and problem-solution-oriented application.
<table>
<thead>
<tr>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory Reading</td>
</tr>
<tr>
<td>Further Reading</td>
</tr>
<tr>
<td>- Selection of literature according to topic</td>
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### Study Format myStudies

<table>
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<tbody>
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### Information about the examination

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<tr>
<td>Course Evaluation: no</td>
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<table>
<thead>
<tr>
<th>Type of Exam</th>
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<tbody>
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### Student Workload

<table>
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<tr>
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<th>Tutorial</th>
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<th>Hours Total</th>
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<td>0 h</td>
<td>0 h</td>
<td>0 h</td>
<td>270 h</td>
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</table>

### Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
- ☐ Vodcast
- ☐ Shortcast
- ☐ Audio
- ☑ Exam Template
- ☑ Review Book
- ☑ Creative Lab
- ☑ Guideline
- ☑ Live Tutorium/Course Feed
### Study Format Distance Learning

<table>
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<tbody>
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### Information about the examination

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### Student Workload

<table>
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<tr>
<th>Self Study</th>
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<td>270 h</td>
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<td>0 h</td>
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<td>270 h</td>
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### Instructional Methods

- ☐ Learning Sprints®
- ☐ Course Book
- ☐ Vodcast
- ☐ Shortcast
- ☐ Audio
- ☐ Exam Template
- ☑ Review Book
- ☐ Creative Lab
- ☐ Guideline
- ☐ Live Tutorium/Course Feed

www.iu.org
Colloquium
Course Code: DLBBT02

<table>
<thead>
<tr>
<th>Study Level</th>
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<th>Contact Hours</th>
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<th>Admission Requirements</th>
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<td>BA</td>
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<td>CP 1</td>
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</table>

**Course Description**
The colloquium will take place after the submission of the bachelor’s thesis. This is done at the invitation of the experts. During the colloquium, students must prove that they have 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 as well as the answering of questions by experts.

**Course Outcomes**
On successful completion, students will be able to

- present a problem from their field of study using academic presentation and communication techniques.
- reflect on the scientific and methodological approach chosen in their bachelor’s thesis.
- demonstrate that they can actively answer subject-related questions from the subject experts (reviewers of the bachelor’s thesis).

**Contents**
- The colloquium includes a presentation of the most important results of the bachelor’s thesis, followed by the student answering the reviewers’ technical questions.

**Literature**

**Compulsory Reading**

**Further Reading**
- Subject specific literature chosen by the student
Study Format myStudies

<table>
<thead>
<tr>
<th>Study Format</th>
<th>Course Type</th>
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<tbody>
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Information about the examination

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<table>
<thead>
<tr>
<th>Type of Exam</th>
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<tbody>
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<td>Presentation: Colloquium</td>
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Student Workload

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Instructional Methods

- [ ] Learning Sprints®
- [ ] Course Book
- [ ] Vodcast
- [ ] Shortcast
- [ ] Audio
- [ ] Exam Template
- [ ] Review Book
- [ ] Creative Lab
- [ ] Guideline
- [ ] Live Tutorium/Course Feed
### Study Format Distance Learning

<table>
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### Information about the examination

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<table>
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<tr>
<th>Type of Exam</th>
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<tbody>
<tr>
<td>Presentation: Colloquium</td>
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### Student Workload

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<th>Practical Experience</th>
<th>Hours Total</th>
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<td>30 h</td>
<td>0 h</td>
<td>0 h</td>
<td>0 h</td>
<td>0 h</td>
<td>30 h</td>
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</table>

### Instructional Methods

- Learning Sprints®
- Course Book
- Vodcast
- Shortcast
- Audio
- Exam Template
- Review Book
- Creative Lab
- Guideline
- Live Tutorium/Course Feed