

# MODULE HANDBOOK

**Bachelor of Engineering**

Industrial Engineering and Management (FS-WINGE)

**180 ECTS**

**Distance Learning**

Classification: Undergraduate

# Contents

---

## 1. Semester

### **Module DLBCSM1: Mathematics I**

Module Description .....	11
Course DLBCSM101: Mathematics I .....	13

### **Module DLBBAB\_E: Business 101**

Module Description .....	17
Course DLBBAB01_E: Business 101 .....	19

### **Module DLBCSIAW: Introduction to Academic Work**

Module Description .....	23
Course DLBCSIAW01: Introduction to Academic Work .....	25

### **Module DLBCSCW: Collaborative Work**

Module Description .....	29
Course DLBCSCW01: Collaborative Work .....	31

### **Module DLBINGEIT\_E: Introduction to the Internet of Things**

Module Description .....	35
Course DLBINGEIT01_E: Introduction to the Internet of Things .....	37

### **Module DLBINGNAG\_E: Scientific and technical fundamentals**

Module Description .....	41
Course DLBINGNAG01_E: Scientific and technical fundamentals .....	43

---

## 2. Semester

### **Module DLBCSM2: Mathematics II**

Module Description .....	51
Course DLBCSM201: Mathematics II .....	53

### **Module DLBDSSPDS: Statistics: Probability and Descriptive Statistics**

Module Description .....	57
Course DLBDSSPDS01: Statistics: Probability and Descriptive Statistics .....	59

### **Module DLBBWME\_E: Managerial Economics**

Module Description .....	63
Course DLBBWME01_E: Managerial Economics .....	65

**Module DLBINGET-01\_E: Electrical Engineering**

Module Description .....	69
Course DLBINGET01-01_E: Electrical Engineering .....	71

**Module DLBDSEAR1: Production Engineering**

Module Description .....	75
Course DLBDSEAR01: Production Engineering .....	77

**Module DLBCSOOPJ: Object-oriented Programming with Java**

Module Description .....	81
Course DLBCSOOPJ01: Object-oriented Programming with Java .....	83

---

**3. Semester****Module DLBMAE: Management Accounting**

Module Description .....	91
Course DLBMAE01: Management Accounting .....	93

**Module DLBDSEIMB1: International Marketing**

Module Description .....	97
Course DLBDSEIMB01: International Marketing .....	99

**Module DLBDSEAR2: Automation and Robotics**

Module Description .....	103
Course DLBDSEAR02: Automation and Robotics .....	105

**Module IGIS\_E: Software Engineering Principles**

Module Description .....	109
Course IGIS01_E: Software Engineering Principles .....	111

**Module DLBCFIE: Corporate Finance and Investment**

Module Description .....	115
Course DLBCFIE01: Corporate Finance and Investment .....	117

**Module DLBDSESCM1: Supply Chain Management I**

Module Description .....	121
Course DLBDSESCM01: Supply Chain Management I .....	123

---

**4. Semester****Module DLBBAEI\_E: Entrepreneurship and Innovation**

Module Description .....	131
Course DLBBAEI01_E: Entrepreneurship and Innovation .....	133

<b>Module DLBINGDT_E: Project: Design Thinking</b>	
Module Description .....	137
Course DLBINGDT01_E: Project: Design Thinking .....	139
<b>Module DLBINGDABD_E: Data Analytics and Big Data</b>	
Module Description .....	143
Course DLBINGDABD01_E: Data Analytics and Big Data .....	145
<b>Module DLBCSIDPITS: Introduction to Data Protection and Cyber Security</b>	
Module Description .....	149
Course DLBCSIDPITS01: Introduction to Data Protection and Cyber Security .....	151
<b>Module DLBCSAPM: Agile Project Management</b>	
Module Description .....	155
Course DLBCSAPM01: Agile Project Management .....	157
<b>Module DLBCSIDM: Intercultural and Ethical Decision-Making</b>	
Module Description .....	161
Course DLBCSIDM01: Intercultural and Ethical Decision-Making .....	163

---

## 5. Semester

<b>Module DLBINGPE_E: Product Development in Industry 4.0</b>	
Module Description .....	171
Course DLBINGPE01_E: Product Development in Industry 4.0 .....	173
<b>Module DLBIEPSPS: Project: Smart Product Solutions</b>	
Module Description .....	177
Course DLBIEPSPS01: Project: Smart Product Solutions .....	179
<b>Module DLBINGSD_E: Smart Devices</b>	
Module Description .....	183
Course DLBINGSD01_E: Smart Devices I .....	185
Course DLBINGSD02_E: Smart Devices II .....	189
<b>Module DLBDESEF: Smart Factory</b>	
Module Description .....	191
Course DLBDESEF01: Smart Factory I .....	194
Course DLBDESEF02: Smart Factory II .....	198
<b>Module DLBINGSM_E: Smart Mobility</b>	
Module Description .....	201
Course DLBINGSM01_E: Smart Mobility I .....	203
Course DLBINGSM02_E: Smart Mobility II .....	207

**Module DLBINGSS\_E: Smart Services**

Module Description .....	209
Course DLBINGSS01_E: Smart Services I .....	211
Course DLBINGSS02_E: Smart Services II .....	215

**Module DLBROEIRA\_E: Industrial Robotics and Automation**

Module Description .....	217
Course DLBROEIRA01_E: Handling Technology .....	219
Course DLBROEIRA02_E: Automation Technology .....	222

**Module DLBROESR\_E: Service Robotics**

Module Description .....	225
Course DLBROESR01_E: Mobile Robotics .....	227
Course DLBROESR02_E: Soft Robotics .....	231

**Module DLBROEICR\_E: Introduction to Cognitive Robotics**

Module Description .....	235
Course DLBROEICR01_E: Digital Signal Processing .....	237
Course DLBROEICR02_E: Fundamentals of NLP and Computer Vision .....	241

**Module DLBROEPRS\_E: Programming of Robotic Systems**

Module Description .....	245
Course DLBROEPRS01_E: Programming with C/C++ .....	247
Course DLBROEPRS02_E: Programming PLCs .....	249

**Module DLBDSEAIS: AI Specialist**

Module Description .....	253
Course DLBDSEAIS01: Artificial Intelligence .....	255
Course DLBDSEAIS02: Project: Artificial Intelligence .....	258

**Module DLBDSEAD: Autonomous Driving**

Module Description .....	261
Course DLBDSEAD01: Self-Driving Vehicles .....	263
Course DLBDSEAD02: Seminar: Current Topics and Trends in Self-Driving Technology .....	267

**Module DLBBUEFPP: Foundations of Programming with Python**

Module Description .....	271
Course DLBDSIPWP01: Introduction to Programming with Python .....	273
Course DLBDSOOFPP01: Object oriented and functional programming in Python .....	276

**Module DLBCSEITPAM: IT project and architecture management**

Module Description .....	279
Course DLBCSEITPAM01: IT Project Management .....	282
Course DLBCSEITPAM02: IT Architecture Management .....	286

<b>Module DLBDSEAS: Applied Sales</b>	
Module Description . . . . .	289
Course DLBDSEAS01: Applied Sales I . . . . .	292
Course DLBDSEAS02: Applied Sales II . . . . .	296
<b>Module IWMB_E: Mobile Software Engineering</b>	
Module Description . . . . .	301
Course IWMB01_E: Mobile Software Engineering . . . . .	303
Course IWMB02_E: Project: Mobile Software Engineering . . . . .	306
<b>Module DLFLI: Foreign Language Italian</b>	
Module Description . . . . .	309
Course DLFLI01: Foreign Language Italian . . . . .	312
<b>Module DLFLF: Foreign Language French</b>	
Module Description . . . . .	317
Course DLFLF01: Foreign Language French . . . . .	320
<b>Module DLSPGLA: German Language</b>	
Module Description . . . . .	325
Course DLSPGLA01: Foreign Language: German . . . . .	327
<b>Module DLFLS: Foreign Language Spanish</b>	
Module Description . . . . .	331
Course DLFLS01: Foreign Language Spanish . . . . .	334
<b>Module DLFLT: Foreign Language Turkish</b>	
Module Description . . . . .	339
Course DLFLT01: Foreign Language Turkish . . . . .	341

## 6. Semester

<b>Module DLBINGSD_E: Smart Devices</b>	
Module Description . . . . .	347
Course DLBINGSD01_E: Smart Devices I . . . . .	349
Course DLBINGSD02_E: Smart Devices II . . . . .	353
<b>Module DLBDSESF: Smart Factory</b>	
Module Description . . . . .	355
Course DLBDSESF01: Smart Factory I . . . . .	358
Course DLBDSESF02: Smart Factory II . . . . .	362
<b>Module DLBINGSM_E: Smart Mobility</b>	
Module Description . . . . .	365

Course DLBINGSM01_E: Smart Mobility I .....	367
Course DLBINGSM02_E: Smart Mobility II .....	371
<b>Module DLBINGSS_E: Smart Services</b>	
Module Description .....	373
Course DLBINGSS01_E: Smart Services I .....	375
Course DLBINGSS02_E: Smart Services II .....	379
<b>Module DLBLODB_E: Digital Business Models</b>	
Module Description .....	381
Course DLBLODB01_E: Digital Business Models .....	383
<b>Module DLBBAPM_E: Principles of Management</b>	
Module Description .....	387
Course DLBBAPM01_E: Principles of Management .....	389
<b>Module DLBBT: Bachelor Thesis</b>	
Module Description .....	393
Course DLBBT01: Bachelor Thesis .....	395
Course DLBBT02: Colloquium .....	398

---

2021-03-01



# 1. Semester

---



# Mathematics I

Module Code: DLBCSM1

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

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

## Module Coordinator

N.N. (Mathematics I)

## Contributing Courses to Module

- Mathematics I (DLBCSM101)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- 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

**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.

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

This module is similar to other modules in the field(s) of Methods.

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the Business & Management field(s).

# 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**

- Beutelspacher, A. (2003): Lineare Algebra. Eine Einführung in die Wissenschaft der Vektoren, Abbildungen und Matrizen. 6. Auflage, Vieweg.
- Beutelspacher, A. (2009): Kryptologie. Eine Einführung in die Wissenschaft vom Verschlüsseln, Verbergen und Verheimlichen. 9. Auflage, Vieweg+Teubner.
- Drews, R./Scholl, W. (2001): Handbuch der Mathematik. Orbis.
- Forster, O. (2001): Analysis 1. 6. Auflage, Vieweg.
- Hoffmann, U. (2005): Mathematik für Wirtschaftsinformatiker. Übungen mit Lösungen. (URL: [http://opus.uni-lueneburg.de/opus/volltexte/2006/383/pdf/Uebungen\\_zur\\_Mathematik\\_fuer\\_Wirtschaftsinformatiker.pdf](http://opus.uni-lueneburg.de/opus/volltexte/2006/383/pdf/Uebungen_zur_Mathematik_fuer_Wirtschaftsinformatiker.pdf) [letzter Zugriff: 27.02.2017]).
- Teschl, G./Teschl, S. (2013): Diskrete Mathematik und lineare Algebra. 4. Auflage, Springer Vieweg, Berlin, Heidelberg.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed



## Business 101

Module Code: DLBBAB\_E

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

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

### Module Coordinator

Prof. Dr. Markus Prandini (Business 101)

### Contributing Courses to Module

- Business 101 (DLBBAB01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam or Written Assessment: Written  
Assignment

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Businesses and their environment
- Types of business organizations
- Management and structure of business
- Production of goods and services
- Marketing of products and services
- Management of labor
- Accounting in business

**Learning Outcomes****Business 101**

On successful completion, students will be able to

- apply business and economic thinking and working methods.
- explain economic subjects and questioning models of business administration.
- classify and formulate corporate goals.
- describe and apply a general business decision-making process.
- recognize and design the organizational structure and process organization in the company.

**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 IUBH**

All Bachelor Programmes in the Business & Management fields

# Business 101

Course Code: DLBBAB01\_E

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

## Course Description

Business 101 deals with the basics of general business administration. It provides students with an understanding of the fundamental questions of doing business. In addition, basic organizational approaches of companies are shown. With the successful completion of the course, the students have gained fundamental knowledge in general business administration. This course lays the foundation for the advanced modules in the further course of their studies.

## Course Outcomes

On successful completion, students will be able to

- apply business and economic thinking and working methods.
- explain economic subjects and questioning models of business administration.
- classify and formulate corporate goals.
- describe and apply a general business decision-making process.
- recognize and design the organizational structure and process organization in the company.

## Contents

1. Businesses and their environment
  - 1.1 Concepts of business
  - 1.2 A system of economic relationships
  - 1.3 Business environment
2. Types of business organizations
  - 2.1 Companies in production and service
  - 2.2 Divisions of companies
3. Management and structure of business
  - 3.1 Basics of Business Management
  - 3.2 Functions of organizations, managers and control
  - 3.3 The decision making process
  - 3.4 Organizational structure of business

4. Production of goods and services
  - 4.1 Origin and development of the production process
  - 4.2 Industrial strategy of business
5. Marketing of goods and services
  - 5.1 Goals and types of marketing
  - 5.2 Marketing mix
6. Management of labor
  - 6.1 Process of management of labor
  - 6.2 Demand in labor
  - 6.3 Human relations in organizations
7. Accounting in business
  - 7.1 Functions and goals of accounting
  - 7.2 Spheres of accounting
  - 7.3 Fundamental principles of accounting

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

- Edebe, A.E. (2013): Basic Principles and Practice of Business Administration. Xlibris, n. p.
- Ferrell, O.C./Hirt, G.A./Ferrell, L. (2020): Business: A Changing World. 12th ed., McGraw-Hill, New York.
- Skripak, S.J. (2018): Fundamentals of Business. 2nd ed., Virginia Tech Libraries, Blacksburg.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam or Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 100 h	<b>Presence</b> 0 h	<b>Tutorial</b> 25 h	<b>Self Test</b> 25 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBBAB01\_E

## Introduction to Academic Work

Module Code: DLBCSIAW

Module Type	Admission Requirements	Study Level	CP	Student Workload
s. Curriculum/see curriculum	none	BA	5	150 h

Semester / Term	Duration	Regularly offered in	
s. Curriculum/see curriculum	Minimum 1 semester	WiSe/SoSe	

### Module Coordinator

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

### Contributing Courses to Module

- Introduction to Academic Work (DLBCSIAW01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Workbook

#### Split Exam

### Weight of Module

s. Curriculum/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

**Learning Outcomes****Introduction to Academic Work**

Nach erfolgreichem Abschluss sind die Studierenden in der Lage, /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 IUBH.

**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 IUBH**

All Bachelor Programmes in the Business & Management field



## Introduction to Academic Work

Course Code: DLBCSIAW01

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

### 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 IUBH examination forms and insight into their requirements and implementation.

### Course Outcomes

Nach erfolgreichem Abschluss sind die Studierenden in der Lage,/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 IUBH.

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

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

- Bortz, J./Döring, N. (2012): Forschungsmethoden und Evaluation. Für Human- und Sozialwissenschaftler. 5. Auflage, Springer Medizin Verlag, Heidelberg.
- Braunecker, C. (2016): How to do Empirie, how to do SPSS – eine Gebrauchsanleitung. Facultas Verlags- und Buchhandels AG, Wien.
- Engelen, E.M. et al. (2010): Heureka – Evidenzkriterien in den Wissenschaften, ein Kompendium für den interdisziplinären Gebrauch. Spektrum akademischer Verlag, Heidelberg.
- Flick, U. et al. (2012): Handbuch Qualitative Sozialforschung. Grundlagen, Konzepte, Methoden und Anwendungen. 3. Auflage, Beltz Verlag, Weinheim.
- Hug, T./Poscheschnik, G. (2015): Empirisch Forschen, 2. Auflage, Verlag Huter & Roth KG, Wien.
- Hussy, W. et al. (2013): Forschungsmethoden in Psychologie und Sozialwissenschaften. 2. Auflage, Springer Medizin Verlag, Heidelberg.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Workbook

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Collaborative Work

Module Code: DLBCSCW

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 5	<b>Student Workload</b> 150 h
--------------------------------------	---------------------------------------	--------------------------	----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

Prof. Dr. Karin Halbritter (Collaborative Work)

### Contributing Courses to Module

- Collaborative Work (DLBCSCW01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Oral Assignment

#### Split Exam

### 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 self-directed and collaborative learning processes with analog and digital media.
- initiate local and virtual cooperation and select suitable methods for shaping cooperation.
- assess different forms of communication in relation to the goals and requirements of different situations and reflect one's own communication and argumentation behaviour.
- explain potentials for conflict and the role of emotions in conflicts and describe the use of systemic methods in the target- and solution-oriented handling of conflicts.
- form an idea of one's own resources, present methods of self-management 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 IUBH**

All Bachelor Programmes in the Business & Management fields

## Collaborative Work

Course Code: DLBCSCW01

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

### 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 self-directed and collaborative learning processes with analog and digital media.
- initiate local and virtual cooperation and select suitable methods for shaping cooperation.
- assess different forms of communication in relation to the goals and requirements of different situations and reflect one's own communication and argumentation behaviour.
- explain potentials for conflict and the role of emotions in conflicts and describe the use of systemic methods in the target- and solution-oriented handling of conflicts.
- form an idea of one's own resources, present methods of self-management 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
8. Construction Kit: Overview of Concepts, Tools, and Methods
  - 8.1 Communicate, Cooperate, Negotiate, Argue
  - 8.2 Think, Reflect, Develop Ideas, Decide, Lead Yourself



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

- Baber, A. (2015): Strategic connections. The new face of networking in a collaborative world. Amacom, New York.
- Goleman, D. (2013): Focus. The hidden driver of excellence. Harper Collins USA, New York.
- Kaats, E./Opheij, W. (2014): Creating conditions for promising collaboration. Alliances, networks, chains, strategic partnerships. Springer Management, Berlin.
- Lang, M. D. (2019): The guide to reflective practice in conflict resolution. Rowman & Littlefield, Lanham/Maryland.
- Martin, S. J./Goldstein, N. J./Cialdini, R. B. (2015): The small BIG. Small changes that spark BIG influence. Profile Books, London.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Introduction to the Internet of Things

Module Code: DLBINGEIT\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 5	<b>Student Workload</b> 150 h
--------------------------------------	---------------------------------------	--------------------------	----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

Prof. Dr. Marian Benner-Wickner (Introduction to the Internet of Things)

### Contributing Courses to Module

- Introduction to the Internet of Things (DLBINGEIT01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

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

**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.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the IT & Technology fields

# 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**

- Buyya, R./Vahid Dastjerdi, A. (Hrsg.) (2016): Internet of things. Principles and paradigms. Morgan Kaufmann, Cambridge, MA.
- Fleisch, E. (Hrsg.) (2005): Internet der dinge. Ubiquitous Computing und RFID in der Praxis. Springer, Berlin.
- Gilchrist, A. (2016): Industry 4.0. The industrial internet of things. Apress, New York, NY.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBINGEIT01\_E



## Scientific and technical fundamentals

Module Code: DLBINGNAG\_E

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

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

### Module Coordinator

Prof. Dr. Moritz Venschott (Scientific and technical fundamentals)

### Contributing Courses to Module

- Scientific and technical fundamentals (DLBINGNAG01\_E)

### Module Exam Type

#### Module Exam

Study Format: Fernstudium  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

**Module Contents**

- Part 1: Introduction
  - Overview
  - Mathematical principles
- Part 2: Physics
  - Thermodynamics
  - Electricity and magnetism
- Part 3: Materials science
  - Solid-State Physics
  - Materials
- Part 4: Engineering Mechanics
  - Statics
  - Dynamics
  - Strength of Materials

**Learning Outcomes****Scientific and technical fundamentals**

On successful completion, students will be able to

- identify basic methods and subject areas in natural sciences.
- know mathematical basics for utilisation in physics.
- identify the basics of thermodynamics, electricity and magnetism.
- identify the physical properties of solids.
- distinguish solids with their bonding and conductivity types and differentiate materials with regard to their properties.
- identify basic tasks of statics and apply them.
- recognize the laws of dynamics and apply them.
- identify different stress types and calculate them.

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

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

**Links to other Study Programs of IUBH**

All Bachelor-Programmes in the IT & Technology fields

## Scientific and technical fundamentals

Course Code: DLBINGNAG01\_E

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

### Course Description

The aim of the course is to give students an overview of essentials in natural sciences relevant to Engineering Studies. For this purpose, selected areas of physics, materials science and technical mechanics are considered. In the first part, this course introduces elementary scientific principles and incorporates mathematical basics. In the second part, thermodynamics, electricity and magnetism are used to give an overview of selected areas of physics. The third part deals with physical properties of solids and how they are used in Materials Science. The course concludes with a fourth topic, which deals with selected aspects of Technical Mechanics.

### Course Outcomes

On successful completion, students will be able to

- identify basic methods and subject areas in natural sciences.
- know mathematical basics for utilisation in physics.
- identify the basics of thermodynamics, electricity and magnetism.
- identify the physical properties of solids.
- distinguish solids with their bonding and conductivity types and differentiate materials with regard to their properties.
- identify basic tasks of statics and apply them.
- recognize the laws of dynamics and apply them.
- identify different stress types and calculate them.

### Contents

1. Introduction to methods and disciplines
  - 1.1 Scientific method
  - 1.2 Disciplines
  - 1.3 Key areas and quantities of physics
  - 1.4 Description of chemical structures
2. Mathematical principles
  - 2.1 Complex numbers
  - 2.2 Differential calculus
  - 2.3 Integral Calculus

3. Thermodynamics
  - 3.1 Basics
  - 3.2 Fundamental principles
  - 3.3 Change of state theory
4. Electricity and magnetism
  - 4.1 Definitions and laws
  - 4.2 Transfer of charges
  - 4.3 Fields
5. Solid-State Physics
  - 5.1 Atomic and quantum physics basics
  - 5.2 Binding types of solids
  - 5.3 Crystalline, amorphous and macromolecular solids
  - 5.4 Conductors, semiconductors and insulators
  - 5.5 Superconductor
6. Materials Science
  - 6.1 Properties of materials
  - 6.2 Metallic materials
  - 6.3 Plastics
  - 6.4 Ceramic materials
  - 6.5 Composite materials
7. Statics
  - 7.1 Basics
  - 7.2 Fundamental tasks
  - 7.3 Trusses
8. Dynamics
  - 8.1 Movement theory
  - 8.2 Rotational movements
  - 8.3 Work and performance
9. Theory of Strength of Materials
  - 9.1 Basic terms
  - 9.2 Stress types
  - 9.3 Surface pressure and moments in metric space

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

- Arnold, B. (2013): Werkstofftechnik für Wirtschaftsingenieure. Springer, Berlin/Heidelberg.
- Böge, A./Böge, W. (2015): Technische Mechanik. Statik – Reibung – Dynamik – Festigkeitslehre – Fluidmechanik. 31. Auflage, Springer Vieweg, Berlin/Heidelberg.
- Eichler, J. (2011): Physik für das Ingenieurstudium. 4. Auflage, Vieweg+Teubner, Wiesbaden.
- Hering, E./Martin, R./Stohrer, M. (Hrsg.) (2012): Physik für Ingenieure. 11. Auflage, Springer, Berlin/Heidelberg.
- Kittel, C. (2013): Einführung in die Festkörperphysik. 15. Auflage, Oldenbourg, München.
- Knight, R. W. (2013): Physics for Scientists and Engineers. A Strategic Approach. 3. Auflage, Pearson, Boston.
- Otto, M. (2011): Rechenmethoden für Studierende der Physik im ersten Jahr. Spektrum, Heidelberg.

**Study Format Fernstudium**

<b>Study Format</b> Fernstudium	<b>Course Type</b> Online Lecture
------------------------------------	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input checked="" type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed







## 2. Semester

---



## Mathematics II

Module Code: DLBCSM2

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	BA	5	

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

### Module Coordinator

Prof. Dr. Leonardo Riccardi (Mathematics II)

### Contributing Courses to Module

- Mathematics II (DLBCSM201)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Selected topics of linear algebra
- Selected chapters on graphs and algorithms

**Learning Outcomes****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(s) of Methods.

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the Business & Management field(s).

# Mathematics II

Course Code: DLBCSM201

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

## 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**

- Hartmann, P. (2014): Mathematik für Informatiker. Ein praxisbezogenes Lehrbuch. 6. Auflage, Springer Vieweg, Wiesbaden.
- Hoffmann, U. (2005): Mathematik für Wirtschaftsinformatiker. Übungen mit Lösungen. (URL: [http://opus.uni-lueneburg.de/opus/volltexte/2006/383/pdf/Uebungen\\_zur\\_Mathematik\\_fuer\\_Wirtschaftsinformatiker.pdf](http://opus.uni-lueneburg.de/opus/volltexte/2006/383/pdf/Uebungen_zur_Mathematik_fuer_Wirtschaftsinformatiker.pdf) [letzter Zugriff: 27.02.2017]).
- Nitzsche, M. (2009): Graphen für Einsteiger. Rund um das Haus vom Nikolaus. 3. Auflage. Vieweg +Teubner, Wiesbaden.
- Teschl, G./Teschl, S. (2013): Diskrete Mathematik und lineare Algebra. 4. Auflage, Springer Vieweg, Berlin, Heidelberg.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBCSM201



## Statistics: Probability and Descriptive Statistics

Module Code: DLBDSSPDS

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 5	<b>Student Workload</b> 150 h
--------------------------------------	---------------------------------------	--------------------------	----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

Dr. Stefan Stöckl (Statistics: Probability and Descriptive Statistics )

### Contributing Courses to Module

- Statistics: Probability and Descriptive Statistics (DLBDSSPDS01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Probability
- Random variables
- Joint distributions
- Expectation and variance
- Inequalities and limit theorems

**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.

**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 IUBH**

All Bachelor Programmes in the Business & Management fields

# Statistics: Probability and Descriptive Statistics

Course Code: DLBDSSPDS01

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

## 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**

- Bruce, P., & Bruce, A. (2017). Practical statistics for data scientists: 50 essential concepts. Sebastopol, CA: O'Reilly.
- Downey, A. B. (2014). Think stats (2nd ed.). Sebastopol, CA: O'Reilly.
- Downey, A. B. (2013). Think Bayes. Sebastopol, CA: O'Reilly.
- Reinhart, A. (2015). Statistics done wrong: The woefully complete guide. San Francisco, CA: No Starch Press.
- Wassermann, L. (2004). All of statistics: A concise course in statistical inference. New York, NY: Springer Science+Business Media.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input checked="" type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLBDSSPDS01

## Managerial Economics

Module Code: DLBBWME\_E

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

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

### Module Coordinator

Prof. Dr. Andreas Simon (Managerial Economics)

### Contributing Courses to Module

- Managerial Economics (DLBBWME01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Basics
- The Invisible Hand of the Market
- Consumer Decisions
- Business Decisions I: Full Competition
- Business Decisions II: Partial Competition
- Business Decisions III: Game Theory
- Advanced Microeconomics

**Learning Outcomes****Managerial Economics**

On successful completion, students will be able to

- understand basic economic interrelationships and apply them to different markets.
- explain the importance of supply, demand and market balance.
- assess the determinants of consumers' willingness to pay.
- discuss the determinants of production decisions and identify peak entrepreneurial strategies.
- assess the influence of different types of markets on production and price decisions.
- analyse strategic interactions between companies.
- critically question traditional economic models on the basis of findings from information and behavioural economics.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the Business & Management fields



# Managerial Economics

Course Code: DLBBWME01\_E

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

## Course Description

The source for (almost) all economic questions is the issue of scarcity. Building on this insight, this course considers three central elements. First, an analysis of the interplay between supply and demand on markets is made. Secondly, the course will consider the development of insights into the behaviour of consumers in markets. In a third part, the course will focus on entrepreneurial decisions that depend, among other things, on production technology available and competitive conditions in markets. These three core elements are taught from an application-oriented standpoint, in which references to (current) challenges of the management of companies are established. The course includes both the examination of economic theories and their application in business practice.

## Course Outcomes

On successful completion, students will be able to

- understand basic economic interrelationships and apply them to different markets.
- explain the importance of supply, demand and market balance.
- assess the determinants of consumers' willingness to pay.
- discuss the determinants of production decisions and identify peak entrepreneurial strategies.
- assess the influence of different types of markets on production and price decisions.
- analyse strategic interactions between companies.
- critically question traditional economic models on the basis of findings from information and behavioural economics.

## Contents

1. Basics
  - 1.1 Definitions & Main Topics of Economics
  - 1.2 Thinking like an Economist
2. The Invisible Hand of the Market
  - 2.1 Supply and Demand
  - 2.2 Market Balance
  - 2.3 Flexibility
  - 2.4 Applications

3. Consumer Decisions
  - 3.1 Utility Theory
  - 3.2 Willingness to Pay
  - 3.3 Demand
  - 3.4 Applications
4. Business Decisions I: Full Competition
  - 4.1 Production
  - 4.2 Costs
  - 4.3 Supply
  - 4.4 Applications
5. Business Decisions II: Partial Competition
  - 5.1 Monopoly
  - 5.2 Monopolistic Competition
  - 5.3 Oligopoly
6. Business Decisions III: Game Theory
  - 6.1 Methodology
  - 6.2 Simultaneous Games
  - 6.3 Sequential Games
7. Advanced Microeconomics
  - 7.1 Information Economics
  - 7.2 Behavioural Economics

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

- Bofinger, P. (2015): Grundzüge der Volkswirtschaftslehre – Eine Einführung in die Wissenschaft von Märkten. 4. Auflage, Pearson Studium, München.
- Frank, R./Cartwright, E. (2016): Microeconomics and Behaviour. 2. Auflage, McGraw-Hill Education, New York.
- Mankiw, N. G./Taylor, M. P. (2018): Grundzüge der Volkswirtschaftslehre. 7. Auflage, Schäffer-Poeschel, Stuttgart.
- Pindyck, R. S./Rubinfeld, D. L. (2018): Mikroökonomie. 9. Auflage, Pearson Studium, München.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBBWME01\_E

## Electrical Engineering

Module Code: DLBINGET-01\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 5	<b>Student Workload</b> 150 h
--------------------------------------	---------------------------------------	--------------------------	----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

Prof. Dr. Moustafa Nawito (Electrical Engineering)

### Contributing Courses to Module

- Electrical Engineering (DLBINGET01-01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

**Module Contents**

- Basic Terms
- Introduction to Direct Current Technology
- Calculation of Direct Current Networks
- Electric Fields
- Introduction to Alternating Current Technology
- Calculation of Alternating Current Networks
- Locus Curves
- Transformers
- Multiphase Systems
- Transient Response

**Learning Outcomes****Electrical Engineering**

On successful completion, students will be able to

- know the basic terms of electrical engineering.
- calculate DC (direct current) circuits and networks.
- know the different types of electrical fields.
- calculate AC (alternating current) circuits and networks.
- know methods for the construction of root locus curves.
- know the basic structure of different types of transformers.
- calculate equivalent circuit diagrams with transformers.
- know multiphase systems and can distinguish them from single-phase systems.
- measure performance in a three-phase system.
- calculate the transient response with the Laplace transformation.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the IT & Technology fields

# Electrical Engineering

Course Code: DLBINGET01-01\_E

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

## Course Description

The aim of the course is to offer students a broad insight into the basics of electrical engineering. First of all, the basic terms of electrical engineering and the relevant physical quantities are introduced. This is followed by two comprehensive sections on direct current and alternating current technology. They are first briefly introduced using their essential elements and properties and then supplemented by methods for calculating the respective circuits and networks. Based on this, multi-phase systems and their application in public power supply are presented. The course concludes with a consideration of the transient response and its calculation using the Laplace transformation.

## Course Outcomes

On successful completion, students will be able to

- know the basic terms of electrical engineering.
- calculate DC (direct current) circuits and networks.
- know the different types of electrical fields.
- calculate AC (alternating current) circuits and networks.
- know methods for the construction of root locus curves.
- know the basic structure of different types of transformers.
- calculate equivalent circuit diagrams with transformers.
- know multiphase systems and can distinguish them from single-phase systems.
- measure performance in a three-phase system.
- calculate the transient response with the Laplace transformation.

## Contents

1. Basic Terms
  - 1.1 Charge, Electric Fields and Voltage
  - 1.2 Current and Resistance
  - 1.3 Electrical Energy and Power
2. Introduction to Direct Current Technology
  - 2.1 Kirchhoff's Laws
  - 2.2 Calculation of Series and Parallel Connections
  - 2.3 Voltage and Current Divider Rule

3. Calculation of Direct Current Networks
  - 3.1 Mesh-Current and Node-Voltage Method
  - 3.2 Superposition Method
  - 3.3 Wye-Delta Transformation of Circuits
  - 3.4 Examples
4. Introduction to Alternating Current Technology
  - 4.1 Electrostatic and Magnetic Fields
  - 4.2 Capacitor and Inductor
  - 4.3 Alternating Variables and their Calculation
  - 4.4 Network Analysis with Complex-Valued Variables
5. Calculation of Alternating Current Networks
  - 5.1 Simple AC Circuits and their Calculation
  - 5.2 Power Types in the AC Circuit
  - 5.3 Oscillating Circuits
  - 5.4 Examples
6. Root Locus Curves
  - 6.1 The Root Locus Concept
  - 6.2 Construction of Various Root Locus Curves
  - 6.3 Examples
7. Transformers
  - 7.1 Basic Functionality
  - 7.2 Equivalent Circuit Diagram
  - 7.3 Measurement Methods
8. Multiphase Systems
  - 8.1 Three-Phase Current Technology (Three-Phase Systems)
  - 8.2 Power Measurement in Three-Phase Systems
9. Transient Response
  - 9.1 Description of Time Dependent Processes with Differential Equations
  - 9.2 Setting up Differential Equations of Electrical Circuits
  - 9.3 Introduction to the Laplace Transformation
  - 9.4 Calculation of Transient Response



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

- Hagmann, G. (2013): Grundlagen der Elektrotechnik. 16. Auflage, AULA-Verlag, Wiebelsheim.
- Scherz, P. (2016): Practical Electronics for Inventors. 4. Auflage, Mcgraw-Hill Education, New York.
- Weißgerber, W. (2015): Elektrotechnik für Ingenieure 1. 10. Auflage, Springer, Wiesbaden.
- Weißgerber, W. (2015): Elektrotechnik für Ingenieure 2. 9. Auflage, Springer, Wiesbaden.
- Weißgerber, W. (2015): Elektrotechnik für Ingenieure 3. 9. Auflage, Springer, Wiesbaden.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input checked="" type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

# Production Engineering

Module Code: DLBDSEAR1

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

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

## Module Coordinator

Prof. Dr. Mario Boßlau (Production Engineering)

## Contributing Courses to Module

- Production Engineering (DLBDSEAR01)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- 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****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.

**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 IUBH**

All Bachelor Programs in the IT & Technology fields

# Production Engineering

Course Code: DLBDSEAR01

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

## 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

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

- Anderson, C. (2012): Makers. The new industrial revolution. Crown Business, New York.
- Bauernhansl, Thomas/Hompel, M. ten/Vogel-Heuser, B. (Hrsg.) (2014): Industrie 4.0 in Produktion, Automatisierung und Logistik. Anwendung – Technologien – Migration. Springer, Wiesbaden.
- Gebhardt, A. (2012): Understanding Additive Manufacturing. Rapid Prototyping – Rapid Tooling – Rapid Manufacturing. Hanser, München/Cincinnati.
- Lachmayer, R./Lippert, R. B./Fahlbusch, T. (Hrsg.) (2016): 3D-Druck beleuchtet. Additive Manufacturing auf dem Weg in die Anwendung. Springer, Berlin/Heidelberg.
- Wittenstein, M. et al. (Hrsg.) (2015): Intelligente Vernetzung in der Fabrik. Industrie 4.0. Umsetzungsbeispiele für die Praxis. Fraunhofer Verlag, Stuttgart.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed



## Object-oriented Programming with Java

Module Code: DLBCSOOPJ

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

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

### 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: 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 IUBH**

All Bachelor Programmes in the IT & Technology field(s).

# Object-oriented Programming with Java

Course Code: DLBCSOOPJ01

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

## 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**

- Java (Hrsg.): Java Platform Standard Edition API Specification. (URL: <http://www.oracle.com/technetwork/java/api-141528.html> [letzter Zugriff: 21.11.2016]).
- Krüger G./Stark T. (2011): Handbuch der Java-Programmierung. 7. Auflage, Addison-Wesley, Salt Lake City.
- Lahres, B./Raýman, G. (2006): Praxisbuch Objektorientierung. Galileo Computing, Bonn.
- Oestereich B. (2012): Analyse und Design mit der UML 2.5. Objektorientierte Softwareentwicklung. 10. Auflage, Oldenbourg, München.
- Ratz, D. et al. (2011): Grundkurs Programmieren in Java. 6. Auflage, Carl Hanser Verlag, München.
- Ullenboom C. (2011): Java ist auch eine Insel. 10. Auflage, Galileo Computing, Bonn.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> yes
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed







# 3. Semester

---



# Management Accounting

Module Code: DLBMAE

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

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

## Module Coordinator

Prof. Dr. Muhammad Ashfaq (Management Accounting)

## Contributing Courses to Module

- Management Accounting (DLBMAE01)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Exam or Written Assessment: Written  
Assignment

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- Management accounting and control function
- Differences between management accounting, and financial accounting
- Cost terms, cost categories, and cost behavior
- Cost allocation
- General and specific cost allocation methods
- Break-even analysis
- Planning and budgeting

**Learning Outcomes****Management Accounting**

On successful completion, students will be able to

- differentiate the management accounting and control function from the financial accounting and the financial management function.
- understand the cost structure and discuss the cost aspects of business operation.
- analyze and apply the tools for viewing and differentiating costs and utilize them to ameliorate business decision-making.
- discuss how the budgeting process and variance analysis works to implement the management control function.

**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 IUBH**

All Bachelor Programmes in the Business & Management fields

# Management Accounting

Course Code: DLBMAE01

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

## Course Description

Management accounting is an important function to operate an organization. Managers need to understand this function in order to be able to run an organization efficiently. In most organizations, decisions, actions and human behavior are directly linked to the feature, use and focus of management accounting information. This course is about understanding the preparation and use of information provided by management accounting. Cost accounting as a central part of the management accounting informs the management about the profitability of its core business. The cost and performance measurement serves the internal decision, control and budgeting process.

## Course Outcomes

On successful completion, students will be able to

- differentiate the management accounting and control function from the financial accounting and the financial management function.
- understand the cost structure and discuss the cost aspects of business operation.
- analyze and apply the tools for viewing and differentiating costs and utilize them to ameliorate business decision-making.
- discuss how the budgeting process and variance analysis works to implement the management control function.

## Contents

1. Introduction to Management Accounting
  - 1.1 Financial vs. Management/Cost Accounting
  - 1.2 Definition of Cost
  - 1.3 Considering the Contemporary Business World Context
  - 1.4 Cost Behavior: Fixed and Variable Costs
2. Cost-Volume-Profit Analysis
  - 2.1 Break-Even Analysis
  - 2.2 Cost Structure and Operating Leverage
  - 2.3 Cost Structure and Variabilization

3. Simplistic Methods of Cost Allocation
  - 3.1 Cost Behavior: Direct and Indirect Costs
  - 3.2 The Need for Cost Allocation
  - 3.3 Predetermined Overhead Rate
  - 3.4 Departmental Overhead Rate
  - 3.5 Over- and Under-Application of Overhead
4. Activity-Based Costing
  - 4.1 The Rationale of Activity-Based Costing
  - 4.2 Implementing Activity-Based Costing
5. Overhead Analysis Sheet
  - 5.1 Departmental Cost Allocation
  - 5.2 Reciprocal Method
  - 5.3 Step Method
6. Relevant Cost Concepts
  - 6.1 Foundational Cost Concepts
  - 6.2 Replacement of Equipment
  - 6.3 Make or Buy
  - 6.4 Special Order
  - 6.5 Drop Product Line
7. Operating Budgets
  - 7.1 The Budgeting Process
  - 7.2 Sales Budget
  - 7.3 Production Budgets
  - 7.4 Administrative Expense Budget
  - 7.5 Budgeted Income Statement
8. Financial Budgets
  - 8.1 Cash Budget
  - 8.2 Conflicts and Pitfalls in Budgeting

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

- Bhimani, A. et al (2015): Management and cost accounting. 6th ed., Pearson, Harlow.
- Walsh, C. (2006): Key management ratios: The clearest guide to the critical numbers that drive your business. 4th ed., Prentice Hall, Harlow.
- Anthony, R./Govindarajan, V. (2006): Management control systems. 12th ed., McGraw Hill, New York, NY.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam or Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 100 h	<b>Presence</b> 0 h	<b>Tutorial</b> 25 h	<b>Self Test</b> 25 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input checked="" type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed



## International Marketing

Module Code: DLBDSEIMB1

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

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

### Module Coordinator

Caterina Fox (International Marketing )

### Contributing Courses to Module

- International Marketing (DLBDSEIMB01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- 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

**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.

**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 IUBH**

All Bachelor Programmes in the Marketing & Communication fields

# International Marketing

Course Code: DLBDSEIMB01

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

## 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

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

- Backhaus, K./Voeth, M. (2010): Internationales Marketing. Schäffer-Poeschel Stuttgart.
- Berndt, R./Altobelli, C. F./Sander, M. (2010): Internationales Marketing-Management. 4. Auflage, Springer, Berlin.
- Homburg, C./Krohmer, H. (2009): Marketingmanagement. Strategie – Instrumente – Umsetzung – Unternehmensführung. 3. Auflage, Gabler, Wiesbaden.
- Horx, M. (2005): Wie wir leben werden. Unsere Zukunft beginnt jetzt. Campus, Frankfurt a. M.
- Kotabe, M./Helsen, K. (2008): Global Marketing Management. 4. Auflage, Wiley, Hoboken (NJ).
- Kotler, P./Keller K. L./Bliemel, F. (2007): Marketing-Management. Strategien für wertschaffendes Handeln. 12. Auflage, Pearson Studium, Stuttgart.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Automation and Robotics

Module Code: DLBDSEAR2

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	DLBDSEAR01	BA	5	150 h

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

### Module Coordinator

N.N. (Automation and Robotics)

### Contributing Courses to Module

- Automation and Robotics (DLBDSEAR02)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Module Exam

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Basics of Automation
- Fundamentals of Measurement Technology
- Sensors
- Basics of Control Engineering
- Basics of Control Technology
- Introduction to Robotics
- Kinematics of a Robot

**Learning Outcomes**

**Automation and Robotics**

On successful completion, students will be able to

- understand the basic aspects of automation.
- understand the different sizes and units in measurement technology.
- differentiate between different measurement methods.
- understand the basic structure of measuring equipment.
- select a suitable sensor based on various criteria.
- understand the elements of control systems.
- describe the behavior of control systems in the time and frequency domain.
- understand the basic principles of control technology.
- convert between different number systems and apply Boolean algebra.
- understand the structure of switching networks, plants, and storages.
- understand important elements of control systems such as signal generators and power amplifiers.
- design simple programmable logic controllers.
- understand the basic structure of industrial robots.
- calculate different movements and positions of jointed-arm robots.

**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 IUBH**

All Bachelor Programs in the IT & Technology fields



# Automation and Robotics

Course Code: DLBDSEAR02

Study Level	Language of Instruction	Contact Hours	CP	Admission Requirements
BA	English		5	DLBDSEAR01

## Course Description

The aim of the course is to provide students with an insight into measurement, control, and regulation technology and convey the basics of robotics. Students will be taught which methods can be used to determine certain measured variables and how measurement errors are dealt with. Based on these fundamentals, various sensors will be presented and students will be able to select suitable sensors based on predefined criteria. The course also introduces students to the basics of control engineering. The different ways of describing the structure and behaviour of control systems are illustrated to the students. The basics of control engineering are also taught. The students receive a short introduction to binary number systems and Boolean algebra, and deal with various basal circuit and control elements. Finally, students will gain an insight into robotics with a focus on industrial robots. In this context, the students learn the description and calculation of positions and movements of individual limbs of a robot arm.

## Course Outcomes

On successful completion, students will be able to

- understand the basic aspects of automation.
- understand the different sizes and units in measurement technology.
- differentiate between different measurement methods.
- understand the basic structure of measuring equipment.
- select a suitable sensor based on various criteria.
- understand the elements of control systems.
- describe the behavior of control systems in the time and frequency domain.
- understand the basic principles of control technology.
- convert between different number systems and apply Boolean algebra.
- understand the structure of switching networks, plants, and storages.
- understand important elements of control systems such as signal generators and power amplifiers.
- design simple programmable logic controllers.
- understand the basic structure of industrial robots.
- calculate different movements and positions of jointed-arm robots.

**Contents**

1. Basics of Automation
  - 1.1 Basic Terms
  - 1.2 Economic Aspects
  - 1.3 Automation Pyramid
  - 1.4 Measuring, Control, and Regulation Systems
  
2. Fundamentals of Measurement Technology
  - 2.1 Measurands and Units
  - 2.2 Forms of Measurement Signals
  - 2.3 Measurement Techniques
  - 2.4 Measuring Equipment
  - 2.5 Evaluation of Measurements and Measurement Errors
  
3. Sensors
  - 3.1 Function and Elements of Sensors
  - 3.2 Criteria for the Selection of Sensors
  - 3.3 Proximity Switches
  - 3.4 Photoelectric Sensors
  - 3.5 Ultrasonic Sensors
  - 3.6 Rotary Encoder
  - 3.7 Force, Torque, and Pressure Gauges
  - 3.8 Temperature Sensors
  - 3.9 Image Processing Sensors
  
4. Basics of Control Engineering
  - 4.1 Elements of Control Systems
  - 4.2 Structure Description
  - 4.3 Static Behavioral Description
  - 4.4 Behavioral Description in the Time Domain
  - 4.5 Behavioral Description in the Frequency Domain
  - 4.6 Practical examples

5. Basics of Control Technology
  - 5.1 Basic Principle and Elements of Control Systems
  - 5.2 Numerical Representations
  - 5.3 Boolean Algebra
  - 5.4 Switching Networks, Plants, and Storage Facilities
  - 5.5 Signal Generators and Power Amplifiers
  - 5.6 Programmable Logic Controllers
  - 5.7 Connection-Programmed Controls
  
6. Introduction to Robotics
  - 6.1 Terms and Classification
  - 6.2 Basic Elements
  - 6.3 Classification of Robots
  
7. Kinematics of a Robot
  - 7.1 Coordinate Systems and Reference Points
  - 7.2 Rotations
  - 7.3 Forward and Reverse Transformations
  - 7.4 Denavit-Hartenberg Transformation

### Literature

#### Compulsory Reading

#### Further Reading

- Heinrich, B./Linke, P./Glöckler, M. (2015): Grundlagen Automatisierung. Springer, Wiesbaden.
- Hesse, S./Malisa, V. (Hrsg.) (2016): Taschenbuch Robotik – Montage – Handhabung. 2. Auflage, Carl Hanser Verlag, München.
- Jazar, R. N. (2010): Theory of Applied Robotics. 2. Auflage, Springer US, Boston (MA).
- Karaali, C. (2013): Grundlagen der Steuerungstechnik. Springer, Wiesbaden.
- Parthier, R. (2011): Messtechnik. Grundlagen und Anwendungen der elektrischen Messtechnik für alle technischen Fachrichtungen und Wirtschaftsingenieure. 6. Auflage, Vieweg & Teubner, Wiesbaden.
- Tietze, U./Schenk, C./Gamm, E. (2016): Halbleiter-Schaltungstechnik. 15. Auflage, Springer, Berlin.
- Zacher, S./Reuter, M. (2014): Regelungstechnik für Ingenieure. Springer, Wiesbaden.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Module Exam

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

# Software Engineering Principles

Module Code: IGIS\_E

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

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

## Module Coordinator

Prof. Dr. Marian Benner-Wickner (Software Engineering Principles)

## Contributing Courses to Module

- Software Engineering Principles (IGIS01\_E)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

### Split Exam

## 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 IUBH**

All Bachelor Programs in the IT & Technology fields

# Software Engineering Principles

Course Code: IGIS01\_E

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

## 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 Cause study
  - 2.5 Challenges in Software Engineering

3. Software life cycle: from planning to replacement
  - 3.1 The software life cycle at a glance
  - 3.2 Planning
  - 3.3 Development
  - 3.4 Operation
  - 3.5 Maintenance
  - 3.6 Shutdown
4. Requirements engineering and specification
  - 4.1 requirements engineering
  - 4.2 Specification
5. Architecture and implementation
  - 5.1 Architecture
  - 5.2 Implementation
6. Testing, operation and evolution
  - 6.1 Testing
  - 6.2 Operation
  - 6.3 Evolution
7. Roles in Software Engineering
  - 7.1 Idea of the role-based approach
  - 7.2 Typical roles
8. Organization of software projects
  - 8.1 From process paradigm towards software process
  - 8.2 Process Paradigms
  - 8.3 Product life cycle
9. Software Process Frameworks
  - 9.1 V-model XT
  - 9.2 Rational Unified Process (RUP)
  - 9.3 Scrum



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

- Gumm, H. P./Sommer, M. (2011): Introduction to Computer Science. 9th edition, Oldenbourg, Munich.
- Hansen, H. R./Neumann, G. (2009): Information Systems 1. Fundamentals and Applications. 10th edition, UTB, Stuttgart.
- Ludewig, J./Lichter, H. (2010): Software Engineering. Basics, people, processes, techniques. 2nd edition, dpunkt.verlag, Heidelberg.
- Sommerville, I. (2015): Software Engineering. 10th edition, Pearson, Munich.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Corporate Finance and Investment

Module Code: DLBCFIE

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

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

### Module Coordinator

Prof. Dr. Muhammad Ashfaq (Corporate Finance and Investment)

### Contributing Courses to Module

- Corporate Finance and Investment (DLBCFIE01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Written Assessment: Written Assignment

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Introduction to Corporate Finance
- Ownership and Corporate Governance
- Understanding Financial Statements and Key Performance Indicators
- Basic Concepts of Financial Theory
- Types of Capital and Financing
- Short-term Financing Decisions
- Capital Budgeting and Decision-Making Methods in Investment

**Learning Outcomes**

**Corporate Finance and Investment**

On successful completion, students will be able to

- recognize the targets and scope of corporate finance and the role of financial markets .
- understand agency-problems in corporations and how incentives and institutional and market mechanisms are used to mitigate agency costs .
- interpret financial statements and key performance indicators and draw conclusions about financing alternatives and potentials of a corporation.
- consider the time value of money and calculate the cost of capital used to optimize future project cash flow streams.
- implement a long-term financing strategy and structure for corporations based on an appropriate mix of equity, debt, leasing, and hybrid financial instruments.
- effectively utilize cash management and working capital management to reduce short-term financing needs and costs.
- prepare investment decisions, estimate expected project cash flows and incorporate cash flow related risks into the decision process.
- apply investment decision methodologies to evaluate and select favorable corporate investment projects.

**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 IUBH**

All Bachelor Programmes in the Business & Management fields

# Corporate Finance and Investment

Course Code: DLBCFIE01

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

## Course Description

This course introduces students to the targets and scope of corporate finance and the role of financial markets. The separation of ownership and control is a constituent feature of corporations; students explore the resulting agency problems and the mechanisms available to mitigate the costs of agency relationships. Students will be introduced to fundamentals of theory and practice regarding principles of modern corporate finance. They will learn to read and analyze financial statements from a financing point of view and develop a detailed understanding of concepts such as the time value of money, interest rates, and cost of capital. After introducing basic concepts, equity and debt financing will be discussed at length. The financial leverage effect on rates of return will be explored and leasing and hybrid financial instruments as an alternative to pure equity and debt financing are presented. Students will study how corporations apply short-term measures of financing and how effective cash and working capital management is used to reduce short-term financing needs and costs. This course will conclude with a discussion on the investment processes of corporations with a particular focus on the challenge of estimating expected cash flows. Students will learn how to include risk as a factor in the decision process and be able to analyse applied investment rules and methodologies.

## Course Outcomes

On successful completion, students will be able to

- recognize the targets and scope of corporate finance and the role of financial markets .
- understand agency-problems in corporations and how incentives and institutional and market mechanisms are used to mitigate agency costs .
- interpret financial statements and key performance indicators and draw conclusions about financing alternatives and potentials of a corporation.
- consider the time value of money and calculate the cost of capital used to optimize future project cash flow streams.
- implement a long-term financing strategy and structure for corporations based on an appropriate mix of equity, debt, leasing, and hybrid financial instruments.
- effectively utilize cash management and working capital management to reduce short-term financing needs and costs.
- prepare investment decisions, estimate expected project cash flows and incorporate cash flow related risks into the decision process.
- apply investment decision methodologies to evaluate and select favorable corporate investment projects.

## Contents

1. Introduction to Corporate Finance
  - 1.1 The Targets and Scope of Corporate Finance
  - 1.2 The Role of a Financial Manager
  - 1.3 The Financial Market Environment
2. Ownership and Corporate Governance
  - 2.1 Legal Types of Firms
  - 2.2 Agency Relations and Agency Problems in Corporations
  - 2.3 Institutional Investors, Incentives, and Market Control Mechanisms
3. Understanding Financial Statements and Key Performance Indicators
  - 3.1 Balance Sheets
  - 3.2 Income Statements
  - 3.3 Cash Flow Statements
  - 3.4 Measuring Performance: Key Performance Indicators
4. Basic Concepts of Financial Theory
  - 4.1 Time Value of Money and Cash Flow Streams
  - 4.2 Interest Rates: Determinants and Quotes
  - 4.3 Estimating the Cost of Capital
5. Types of Capital and Financing
  - 5.1 Equity Capital
  - 5.2 Debt Financing
  - 5.3 Leasing
  - 5.4 Financial Leverage and Capital Structure
6. Short-Term Financing Decisions
  - 6.1 Cash Budgets and Short-Term Financial Plans
  - 6.2 Treasury and Cash Management
  - 6.3 Working Capital Management
7. Capital Budgeting and Decision-Making Methods in Investment
  - 7.1 Capital Budgeting and Investments
  - 7.2 Incorporating Risk in Capital Budgeting Decisions
  - 7.3 Investment Rules and Decision-Making Methods

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

- Berk, J., & DeMarzo, P. (2017). Corporate finance (4th ed.). Upper Saddle River, NJ: Pearson.
- Brealey, R. A., Myers, S. C., & Allen, F. (2020). Principles of corporate finance (13th ed.). New York, NY: McGraw-Hill.
- Ross, S. A., Westerfield, R. W., Jaffe, J., & Jordan, B. D. (2019). Corporate finance (12th ed.). New York, NY: McGraw-Hill.
- Zutter, C. J., & Smart, S. B. (2019). Principles of managerial finance (15th ed.). Upper Saddle River, NJ: Pearson.
- Moles, P., Parrino, R., & Kidwell, D. S. (2011). Corporate finance. Chichester: John Wiley & Sons.
- Baker, H. K., & English, P. (2011). Capital budgeting valuation: Financial analysis for today's investment projects. Chichester: John Wiley & Sons.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed



# Supply Chain Management I

Module Code: DLBDESECM1

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

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

## Module Coordinator

N.N. (Supply Chain Management I )

## Contributing Courses to Module

- Supply Chain Management I (DLBDESECM01)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Module Exam

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- 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

**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.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the Transport & Logistics fields

# Supply Chain Management I

Course Code: DLBDESECM01

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

## 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

2. Selected Theoretical Concepts for the Supply Chain Concept
  - 2.1 New Institutional Economics
  - 2.2 Game Theory
  - 2.3 Network Approach
  - 2.4 Other Theoretical Additions
3. Supply Chain Management
  - 3.1 Basic Information on the Goals and Scope of SCM
  - 3.2 Popular Problem Areas of the SCM
  - 3.3 Supply Chain Management as an Evolutionary Step in Logistics
  - 3.4 Supply Chain Management as Cooperation Management
4. SCM Model
  - 4.1 Basic Information on the Term SCM Models
  - 4.2 SCOR Model
  - 4.3 SCM Task Model
5. SCM as a Coordination Problem
  - 5.1 Basic Information on the Concept of Coordination
  - 5.2 Coordination Concepts, Context, and Perspectives of SCM
  - 5.3 Coordination Instruments

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

- Arndt, H. (2018): Supply Chain Management. Optimierung logistischer Prozesse. 7. Auflage, Gabler, Wiesbaden.
- Grosche, P. (2012): Konfiguration und Koordination von Wertschöpfungsaktivitäten in internationalen Unternehmen. Eine empirische Untersuchung in der Automobilindustrie. Gabler-Verlag, Wiesbaden.
- Heiserich, O.E./Helbig, K./Ullmann, W. (2011): Logistik. Eine praxisorientierte Einführung. 4. Auflage, Gabler-Verlag | Springer Fachmedien, Wiesbaden 2011.
- Hertel, J./Zentes, J./Schramm-Klein, H. (2011): Supply-Chain-Management und Warenwirtschaftssysteme im Handel. 2. Auflage, Springer Verlag, Heidelberg.
- Hungenberg, H. (2014): Strategisches Management in Unternehmen. Ziele-Prozesse-Verfahren. 8. Auflage, Wiesbaden.
- Pfohl, H. C. (2010): Logistiksysteme. Betriebswirtschaftliche Grundlagen. 8 Auflage, Springer, Berlin.
- Schulte, C. (2013): Logistik. Wege zur Optimierung der Supply Chain. 6. Auflage, Vahlen, München.
- Werner, H. (2013): Supply Chain Management. Grundlagen, Strategien, Instrumente und Controlling. 5. Auflage, Gabler, Wiesbaden.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Module Exam

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed







# 4. Semester

---



## Entrepreneurship and Innovation

Module Code: DLBBAEI\_E

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

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

### Module Coordinator

Prof. Dr. Mirko Bendig (Entrepreneurship and Innovation)

### Contributing Courses to Module

- Entrepreneurship and Innovation (DLBBAEI01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Written Assessment: Written Assignment

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Entrepreneurship
- The Entrepreneur
- The Entrepreneurial Process
- Innovation
- Planning, Business Models and Strategy

**Learning Outcomes****Entrepreneurship and Innovation**

On successful completion, students will be able to

- understand the core principles of entrepreneurship.
- define the main characteristics of entrepreneurs as well as their motivations and their behavior.
- describe the entrepreneurial process with its different stages.
- recognize problems and negative side effects of entrepreneurship.
- define innovation and explain the innovation lifecycle.
- understand a business plan and what defines a business model.

**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 IUBH**

All Bachelor Programmes in the Business and Management fields

# Entrepreneurship and Innovation

Course Code: DLBBAEI01\_E

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

## Course Description

Entrepreneurship and innovation are the basis and one of the driving forces of every economy. Entrepreneurship and innovation are of great importance in every phase of the economic development cycle. They are important drivers for competition, competitiveness and survival in globalized markets. In this module, students are familiarized with the ideas, motives and concepts of entrepreneurship. They also get an overview of the identification, evaluation and further development of innovations.

## Course Outcomes

On successful completion, students will be able to

- understand the core principles of entrepreneurship.
- define the main characteristics of entrepreneurs as well as their motivations and their behavior.
- describe the entrepreneurial process with its different stages.
- recognize problems and negative side effects of entrepreneurship.
- define innovation and explain the innovation lifecycle.
- understand a business plan and what defines a business model.

## Contents

1. Entrepreneurship
  - 1.1 Defining Entrepreneurship
  - 1.2 Benefits of Entrepreneurial Activity
  - 1.3 Types of Entrepreneurs
  - 1.4 Global Trends in Entrepreneurship
2. The Entrepreneur
  - 2.1 Defining Entrepreneur
  - 2.2 Characteristics of Entrepreneurs
  - 2.3 Entrepreneurial Motivation and Behavior

3. The Entrepreneurial Process
  - 3.1 Stages of the Entrepreneurial Process
  - 3.2 Venture Creation
  - 3.3 Creativity Management and Time Pressure
4. Innovation
  - 4.1 Defining Innovation
  - 4.2 Innovation Lifecycle
  - 4.3 Sources of Innovation
  - 4.4 Encouraging Entrepreneurship and Innovation
5. Planning, Business Models and Strategy
  - 5.1 Business Plan
  - 5.2 Designing a Business Model
  - 5.3 Developing a Business Strategy

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

- Bessant, J.R./Tidd, J. (2015): Innovation and Entrepreneurship. 3rd ed., Wiley, Hoboken.
- Mazzarol, T./Reboud, S. (2020): Entrepreneurship and Innovation – Theory, Practice and Context. 4th ed., Springer, Singapore.
- Mazzarol, T./Reboud, S. (2020): Workbook for Entrepreneurship and Innovation – Theory, Practice and Context. 4th ed., Springer, Singapore.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Written Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBBAEI01\_E



## Project: Design Thinking

Module Code: DLBINGDT\_E

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

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

### Module Coordinator

N.N. (Project: Design Thinking)

### Contributing Courses to Module

- Project: Design Thinking (DLBINGDT01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Written Assessment: Project Report

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Basic principles of Design Thinking
- The Design Thinking microprocess
- 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****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 field of Design

**Links to other Study Programs of IUBH**

All Bachelor Programs in the Design, Architecture & Construction fields

## Project: Design Thinking

Course Code: DLBINGDT01\_E

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

### 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

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

- Brown, T. (2008): Design Thinking. In: Harvard Business Review, June, p. 84–95.
- Brown, T./Kätz, B. (2019): Change by design: How design thinking transforms organizations and inspires innovation (Revised and updated edition). Harper Business, New York City, NY.
- IDEO (2015): The field guide to human-centered design: Design kit. 1st edition, IDEO, San Francisco, CA.
- Lewrick, M./Patrick, L./Leifer, L. (2018): The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems. JOHN WILEY & Sons, Hoboken, NJ.
- Lewrick, M./Patrick, L./Leifer, L. (2020). Design Thinking Toolbook. JOHN WILEY & Sons, Hoboken, NJ.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLBINGDT01\_E

## Data Analytics and Big Data

Module Code: DLBINGDABD\_E

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

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

### Module Coordinator

N.N. (Data Analytics and Big Data)

### Contributing Courses to Module

- Data Analytics and Big Data (DLBINGDABD01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Written Assessment: Case Study

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Introduction to Data Analysis
- Statistical Basics
- Data Mining
- Big Data Methods and Technologies
- Legal Aspects of Data Analysis
- Solution Scenarios
- Application of Big Data in the Industry

<p><b>Learning Outcomes</b></p> <p><b>Data Analytics and Big Data</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ distinguish between information and data and know the meaning of these terms for decision-making.</li> <li>▪ derive the Big Data issue, especially in connection with Internet of Things, and describe it using examples.</li> <li>▪ identify basics from statistics, which are necessary for the analysis of large data sets.</li> <li>▪ identify the process of data mining and classify different methods in it.</li> <li>▪ identify selected methods and technologies that are used in the Big Data context and apply them to simple examples.</li> <li>▪ recognize the legal framework for the application of data analysis in Germany and internationally.</li> <li>▪ identify the specific prospects and challenges of applying Big Data analyses in industry.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the field of Engineering</p>	<p><b>Links to other Study Programs of IUBH</b></p> <p>All Bachelor Programs in the IT &amp; Technology fields</p>



# Data Analytics and Big Data

Course Code: DLBINGDABD01\_E

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

## Course Description

The aim of the course is to familiarize students with selected methods and techniques of data analysis in the context of continuously increasing, heterogeneous data sets. To this end, the fundamental relevance of Big Data methods is presented by drawing on the historical development of stored data. One decisive factor here is the continuous transmission Internet of Things sensor data to other systems. This is followed by a short introduction to the essential statistical fundamentals before the individual steps of the data mining process are discussed. In distinction to these classical procedures, selected methods are presented with which stored data in the Big Data context can be made analyzable. As data analysis is subject to certain legal frameworks, this course also covers legal aspects such as data protection. The course concludes with an overview of the practical application of Big Data methods and tools. In particular, fields of application in the industrial context are examined.

## Course Outcomes

On successful completion, students will be able to

- distinguish between information and data and know the meaning of these terms for decision-making.
- derive the Big Data issue, especially in connection with Internet of Things, and describe it using examples.
- identify basics from statistics, which are necessary for the analysis of large data sets.
- identify the process of data mining and classify different methods in it.
- identify selected methods and technologies that are used in the Big Data context and apply them to simple examples.
- recognize the legal framework for the application of data analysis in Germany and internationally.
- identify the specific prospects and challenges of applying Big Data analyses in industry.

## Contents

1. Introduction to Data Analysis
  - 1.1 Decisions, Information, Data
  - 1.2 Historical Development of Data Storage and Evaluation
  - 1.3 Big Data: Features and Examples
  - 1.4 Data Analysis
  - 1.5 Internet of Things as Driver for Big Data

2. Statistical Basics
  - 2.1 Descriptive Data Analysis
  - 2.2 Inferential Data Analysis
  - 2.3 Explorative Data Analysis
  - 2.4 Multivariate Data Analysis
3. Data Mining
  - 3.1 Knowledge Discovery in Databases
  - 3.2 Association Analysis
  - 3.3 Correlation Analysis
  - 3.4 Forecast
  - 3.5 Cluster Analysis
  - 3.6 Classification
4. Big Data Methods and Technologies
  - 4.1 Technology Building Blocks
  - 4.2 MapReduce
  - 4.3 Text- and Semantic Analysis
  - 4.4 Audio and Video Analysis
  - 4.5 BASE and NoSQL
  - 4.6 In-Memory Databases
  - 4.7 Big Data Success Factors
5. Legal Aspects of Data Analysis
  - 5.1 Data Protection Principles in Germany
  - 5.2 Anonymization and Pseudonymization
  - 5.3 International Data Analysis
  - 5.4 Performance and Integrity Protection
6. Solution Scenarios
7. Application of Big Data in the Industry
  - 7.1 Production and Logistics
  - 7.2 Increased Efficiency in the Supply Chain
  - 7.3 Key-Factor Data
  - 7.4 Examples and Conclusion

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

- Brandt, S. (2013): Datenanalyse für Naturwissenschaftler und Ingenieure. Mit statistischen Methoden und Java-Programmen. 5. Auflage, Springer, Wiesbaden.
- Dorschel, J. (Hrsg.) (2015): Praxishandbuch Big Data. Wirtschaft – Recht – Technik. Springer Gabler Wiesbaden.
- Gandomi, A./Haider, M. (2015): Beyond the hype. Big data concepts, methods, and analytics. In: International Journal of Information Management, 35. Jg., Heft 2, S. 137–144.
- Provost, F./Fawcett, T. (2013): Data science for business. What You Need to Know About Data Mining and Data-Analytic Thinking. O'Reilly, Sebastopol (CA).
- Runkler, T. A. (2015): Data Mining. Modelle und Algorithmen intelligenter Datenanalyse. 2. Auflage, Springer Vieweg, Wiesbaden.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Case Study
--	----------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Case Study

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Introduction to Data Protection and Cyber Security

Module Code: DLBCSIDPITS

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

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

### 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: 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 IUBH**

All Bachelor Programmes in the IT & Technology field(s).

# Introduction to Data Protection and Cyber Security

Course Code: DLBCSIDPITS01

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

## 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

- Eckert, C. (2014): IT-Sicherheit. Konzepte – Verfahren – Protokolle. 9. Auflage, De Gruyter, München.
- Poguntke, W. (2013): Basiswissen IT-Sicherheit. Das Wichtigste für den Schutz von Systemen & Daten. 3. Auflage, W3I, Dortmund.
- Witt, B. C. (2010): Datenschutz kompakt und verständlich. 2. Auflage, Vieweg+Teubner, Wiesbaden.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLBCSIDPITS01

# Agile Project Management

Module Code: DLBCSAPM

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

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

## Module Coordinator

Dr. Mark Menzel (Agile Project Management)

## Contributing Courses to Module

- Agile Project Management (DLBCSAPM01)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Written Assessment: Project Report

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- In this course, students are taught action competences in the field of agile project management. They will be familiarized with the values, activities, roles, and artifacts of agile procedures using Scrum as an example.

**Learning Outcomes**

**Agile Project Management**

On successful completion, students will be able to

- explain the differences between agile and plan-driven project management.
- explain agile principles.
- work together in an agile manner according to the values defined in Scrum.
- apply the activities defined in Scrum.
- take responsibility for the roles defined in Scrum.
- create and maintain the artefacts defined in Scrum.

**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 IUBH**

All Bachelor Programmes in the IT & Technology fields

# Agile Project Management

Course Code: DLBCSAPM01

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

## Course Description

Students will receive a practical introduction to agile project management in this course. In addition to teaching its individual basic principles, the differences between agile project management and plan-driven project management will be examined in detail. In order to understand and experience agile project management, the values, activities, roles, and artefacts of typical agile procedures are presented using Scrum and then practiced on an example project.

## Course Outcomes

On successful completion, students will be able to

- explain the differences between agile and plan-driven project management.
- explain agile principles.
- work together in an agile manner according to the values defined in Scrum.
- apply the activities defined in Scrum.
- take responsibility for the roles defined in Scrum.
- create and maintain the artefacts defined in Scrum.

## Contents

- This course teaches students various skills in the field of agile project management. In contrast to plan-driven project management, the principles of agility used in modern software development are taught. Using the example of Scrum, students will acquire skills in applying an agile approach, and then apply their knowledge of respective roles and activities in a simple project to gain initial practical experience, documenting it in a project report. The content of the projects results from the individual abilities and requirements of the students.

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

- Röpstorff, S./Wiechmann, R. (2012): Scrum in der Praxis. Erfahrungen, Problemfelder und Erfolgsfaktoren. dpunkt.verlag, Heidelberg.
- Rubin, K. S. (2014): Essential Scrum. Umfassendes Scrum-Wissen aus der Praxis. Mitp Verlag, Frechen.
- Roock, A. (2011): Software-Kanban. Eine Einführung. In: Projektmagazin, Heft 4,
- Leffingwell, D. et al. (o. J.): Scaled Agile Framework. (URL: <http://scaledagileframework.com/> [letzter Zugriff: 17.07.2015]).
- Schwaber, K./Sutherland, J. (o. J.): The Scrum Guide - The definitive Guide to Scrum: The Rules of the Game. [www.scrumguides.org](http://www.scrumguides.org)

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLBCSAPM01



## Intercultural and Ethical Decision-Making

Module Code: DLBCSIDM

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

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

### Module Coordinator

Prof. Dr. Jürgen Matthias Seeler (Intercultural and Ethical Decision-Making)

### Contributing Courses to Module

- Intercultural and Ethical Decision-Making (DLBCSIDM01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Written Assessment: Case Study

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Basics of Intercultural Competence
- Cultural Concepts
- Culture and Ethics
- Implications of Current Ethical Problems in the Area of Interculturality, Ethics, and Diversity
- Intercultural Learning and Working
- Case Studies for Cultural and Ethical Conflicts

**Learning Outcomes**

**Intercultural and Ethical Decision-Making**

On successful completion, students will be able to

- explain the most important terms in the areas of interculturality, diversity, and ethics.
- distinguish different explanatory patterns of culture.
- understand culture at different levels.
- plan processes of intercultural learning and working.
- understand the interdependencies of culture and ethics.
- independently work on a case study on intercultural competence.

**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 IUBH**

All Bachelor Programs in the Business & Management fields

# Intercultural and Ethical Decision-Making

Course Code: DLBCSIDM01

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

## Course Description

In this course, students acquire the necessary knowledge to understand intercultural competencies and current developments in the fields of diversity and ethics. Students will understand how to systematically plan and implement learning processes for the development of competences important in these areas. First, important terms are clarified and differentiated from each other, and cultural aspects are explained from different perspectives. In addition, students learn that cultural issues are relevant at different levels, for example, within a state, company, or other group. In this context, students also recognize the connection between ethics and culture with different interdependencies. On the basis of this knowledge, students are then familiarized with the different possibilities and potentials of intercultural and ethical learning and working. Practical cases are used to illustrate the importance of the relationships learned for today's work context in many companies. The students then work on a case study in which the acquired knowledge is systematically applied.

## Course Outcomes

On successful completion, students will be able to

- explain the most important terms in the areas of interculturality, diversity, and ethics.
- distinguish different explanatory patterns of culture.
- understand culture at different levels.
- plan processes of intercultural learning and working.
- understand the interdependencies of culture and ethics.
- independently work on a case study on intercultural competence.

## Contents

1. Basics of Intercultural and Ethical Competence to Act
  - 1.1 Subject Areas, Terms, and Definitions
  - 1.2 Relevance of Intercultural and Ethical Action
  - 1.3 Intercultural Action - Diversity, Globalization, Ethics
2. Cultural Concepts
  - 2.1 Hofstede's Cultural Dimensions
  - 2.2 Culture Differentiation According to Hall
  - 2.3 Locus of Control Concept to Rotter

3.	Culture and Ethics
3.1	Ethics - Basic Terms and Concepts
3.2	Interdependence of Culture and Ethics
3.3	Ethical Concepts in Different Regions of the World
4.	Current Topics in the Area of Interculturality, Ethics, and Diversity
4.1	Digital Ethics
4.2	Equality and Equal Opportunities
4.3	Social Diversity
5.	Intercultural Learning and Working
5.1	Acculturation
5.2	Learning and Working in Intercultural Groups
5.3	Strategies for Dealing with Cultural Conflicts
6.	Case Studies for Cultural and Ethical Conflicts
6.1	Case Study: Interculturality
6.2	Case Study: Diversity
6.3	Case Study: Interculturality and Ethics

<b>Literature</b>
<b>Compulsory Reading</b>
<p><b>Further Reading</b></p> <ul style="list-style-type: none"> <li>▪ Emrich, C. (2011): Interkulturelles Management: Erfolgsfaktoren im globalen Business. Kohlhammer-Verlag, Stuttgart/Berlin/Köln.</li> <li>▪ Erll, A./Gymnich, M. (2015): Uni-Wissen Interkulturelle Kompetenzen: Erfolgreich kommunizieren zwischen den Kulturen – Kernkompetenzen. 4. Auflage, Klett Lerntraining, Stuttgart.</li> <li>▪ Eß, O. (2010): Das Andere lehren: Handbuch zur Lehre Interkultureller Handlungskompetenz. Waxmann Verlag, Münster.</li> <li>▪ Hofstede, G./ Hofstede, G. J./Minkov, M. (2017): Lokales Denken, globales Handeln Interkulturelle Zusammenarbeit und globales Management. 6. Auflage, Beck, München.</li> <li>▪ Leenen, W.R./Groß, A. (2018): Handbuch Methoden Interkultureller Bildung und Weiterbildung. Verlag Vandenhoeck &amp; Ruprecht, Göttingen.</li> <li>▪ Thomas, A. (2011): Interkulturelle Handlungskompetenz. Versiert, angemessen und erfolgreich im internationalen Geschäft. Gabler-Verlag, Wiesbaden.</li> </ul>

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Case Study
--	----------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Case Study

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBCSIDM01







# 5. Semester

---



## Product Development in Industry 4.0

Module Code: DLBINGPE\_E

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

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

### Module Coordinator

N.N. (Product Development in Industry 4.0 )

### Contributing Courses to Module

- Product Development in Industry 4.0 (DLBINGPE01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Introduction to modern product development
- Fundamentals of product development
- Methods in the product development process
- Alternative design approaches
- Digitalization of product design
- Customized mass production
- Outlook: Digital engineering and operation

**Learning Outcomes****Product Development in Industry 4.0**

On successful completion, students will be able to

- recall the historical development of industrial production.
- name current trends in the context of the "fourth industrial revolution" and their impact on product development.
- know the basic methods in product development.
- know the traditional product development process from design theory.
- differentiate alternative approaches to product development.
- name selected tools in the context of digital and virtual product design.
- explain the lot size problem and determine lot sizes for traditional production types.
- distinguish traditional production types from modern strategies such as customized mass production and rapid manufacturing.
- name current approaches to the complete digitalization of product creation and production processes in terms of digital engineering.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programs in the IT & Technology fields

# Product Development in Industry 4.0

Course Code: DLBINGPE01\_E

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

## Course Description

The aim of the course is to give students an overview of current approaches to modern product development in the context of Industry 4.0. Based on traditional methods and tools of product development, relevant alternative design approaches are described, which put the consumer in the center of the design. In addition, modern tools to support product design are presented with which an engineer can digitally capture and simulate both the static/geometric and dynamic properties of a product. In addition, aspects of customized mass production will be discussed and compared with traditional production types. As an outlook on future developments, current research approaches for consistently digitalized product development are presented.

## Course Outcomes

On successful completion, students will be able to

- recall the historical development of industrial production.
- name current trends in the context of the "fourth industrial revolution" and their impact on product development.
- know the basic methods in product development.
- know the traditional product development process from design theory.
- differentiate alternative approaches to product development.
- name selected tools in the context of digital and virtual product design.
- explain the lot size problem and determine lot sizes for traditional production types.
- distinguish traditional production types from modern strategies such as customized mass production and rapid manufacturing.
- name current approaches to the complete digitalization of product creation and production processes in terms of digital engineering.

## Contents

1. Introduction to Modern Product Development
  - 1.1 Terms of Industrial Production
  - 1.2 The Fourth Industrial Revolution
  - 1.3 Turnaround in the Factors of Production
  - 1.4 Trends in Product Development

2. Fundamentals of Product Development
  - 2.1 Methods of Product Planning
  - 2.2 Methods of the Solution Search
  - 2.3 Selection and Evaluation of Alternatives
3. Methods in the Product Development Process
  - 3.1 Clarify Requirements
  - 3.2 Concept
  - 3.3 Draft
  - 3.4 Development
4. Alternative Design Approaches
  - 4.1 Design Thinking
  - 4.2 Personas
  - 4.3 Human-Centered Design According to ISO 9241-210
  - 4.4 Participatory Design
  - 4.5 Open Innovation
  - 4.6 Empathic Design
5. Digitalization of Product Design
  - 5.1 From Drawing Board to Digital Functional Model
  - 5.2 Computer-Aided Engineering
  - 5.3 Computer-Aided Quality
  - 5.4 Engineering and Product Data Management
  - 5.5 Simulation Data Management
6. Customized Mass Production
  - 6.1 Traditional Types of Production
  - 6.2 Lot Size Problem and Planning
  - 6.3 Mass Customization
  - 6.4 Rapid Manufacturing
7. Outlook: Digital Engineering and Operation
  - 7.1 Definition
  - 7.2 Fields of Application
  - 7.3 Data Mining
  - 7.4 Modeling of Dynamic Product Properties
  - 7.5 Provision of Information

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

- Kull, H. (2015): Mass Customization. Opportunities, Methods, and Challenges for Manufacturers. Apress, Berkeley/New York.
- Kahn, K. B. (2004): The PDMA handbook of new product development. John Wiley & Sons, Inc, Hoboken, NJ.
- Levy, J. (2015): UX strategy: How to devise innovative digital products that people want. 1st edition, O'Reilly Media, Inc., Sebastopol, CA.
- Olsen, D. (2015): The Lean product playbook: How to innovate with minimum viable products and rapid customer feedback. Wiley, Hoboken, NJ.
- Reinertsen, D. G. (2009): The principles of product development flow: Second generation Lean product development. Celeritas, Redondo Beach, CA.
- Stark, J. (2011): Product lifecycle management: 21st century paradigm for product realisation. Springer, London.
- Ulrich, K. T./Eppinger, S. D. (2015): Product design and development. 6th edition, Mc-Graw Hill, New York, NY.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed



## Project: Smart Product Solutions

Module Code: DLBIEPSPS

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

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

### Module Coordinator

N.N. (Project: Smart Product Solutions)

### Contributing Courses to Module

- Project: Smart Product Solutions (DLBIEPSPS01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Oral Project Report

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

This course focuses on the application of agile engineering methods for smart product solutions within the framework of a practice-oriented project. The architecture and mechanics of smart product solutions will be described by means of their integrated business model components.

<p><b>Learning Outcomes</b></p> <p><b>Project: Smart Product Solutions</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ answer the question of the relevance of dynamic business models of smart product solutions for business practice.</li> <li>▪ describe and analyze smart product solutions by means of the business model architecture and mechanics.</li> <li>▪ select and apply the right tools from the engineering methodology toolbox of smart product solutions for the modelling and analysis of digital business models in a practice-oriented way.</li> <li>▪ develop management cockpits to support decision-making in the implementation of smart product solutions.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the fields of Computer Science &amp; Software Development</p>	<p><b>Links to other Study Programs of IUBH</b></p> <p>All Bachelor Programs in the IT &amp; Technology fields</p>

## Project: Smart Product Solutions

Course Code: DLBIEPSPS01

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

### Course Description

Smart product solutions have the potential to increase the efficiency of existing business models in the context of digital transformation. In addition to the expansion and optimization of traditional business models, smart product solutions also create completely new business models, in which, for example, revenues are not linked to the transfer of ownership of the product, but to its use. In practice, however, the design and analysis of smart product solutions and their business models is difficult for many companies, as the complexity of these smart solutions results in insufficient methodological know-how. Against this background, the students apply various instruments and modelling tools to describe and analyze smart product solutions within the framework of a practice-oriented project.

### Course Outcomes

On successful completion, students will be able to

- answer the question of the relevance of dynamic business models of smart product solutions for business practice.
- describe and analyze smart product solutions by means of the business model architecture and mechanics.
- select and apply the right tools from the engineering methodology toolbox of smart product solutions for the modelling and analysis of digital business models in a practice-oriented way.
- develop management cockpits to support decision-making in the implementation of smart product solutions.

### Contents

- By means of an agile engineering approach, students learn about the complex interrelationships of smart product solutions in a project-oriented setting. In addition to the structural description, students also gain a comprehensive insight into the quantitative modeling of the dynamic interrelationships of smart product solutions and their business models at a specific product solution level. The consistent application of techniques and tools from the engineering construction kit of smart product solutions enables the development of new business models as well as the adaptation of existing business models through the flexible configuration of interdependent components. Radical innovations with a completely new benefits are just as possible as incremental adjustments in a more evolutionary transformation process. Through the abstract description of the architecture

and the dynamic modelling of the mechanics of the smart product solutions and their business models, students learn the basics for effective decision support in practice, which ensures continuous learning in a digital world with growing dynamic complexity.

#### Literature

#### Compulsory Reading

#### Further Reading

- Avlonitis, V. (2013): PSS readiness manual. A workbook in the PROTEUS series: # 3. 1st edition, Kongens Lyngby: Technical University of Denmark.
- Bejbro Andersen, J. (2013): PSS business models. A workbook in the PROTEUS series: # 7. 1st edition, Kongens Lyngby: Technical University of Denmark.
- Meier, H./Boßlau, M. (2013): Design and Engineering of Dynamic Business Models for Industrial Product-Service Systems. In Y. Shimomura & K. Kimita (Eds.), Lecture Notes in Production Engineering. The Philosopher's Stone for Sustainability: Proceedings of the 4th CIRP International Conference on Industrial Product-Service Systems, Tokyo, Japan, November 8th - 9th, 2012 (pp. 179–184). Springer, Berlin, Heidelberg.
- Sakao, T./Lindahl, M. (2009): Introduction to Product/Service-System Design. Springer, London.
- Zawadzki, P./Żywicki, K. (2016): Smart Product Design and Production Control for Effective Mass Customization in the Industry 4.0 Concept. Management and Production Engineering Review, 7(3), 105–112.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Oral Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLBIEPSPS01

## Smart Devices

Module Code: DLBINGSD\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### 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

#### Module Exam

#### Split Exam

##### Smart Devices I

- Study Format "Fernstudium": Exam, 90 Minutes

##### Smart Devices II

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

### Weight of Module

see curriculum

<p><b>Module Contents</b></p> <p><b>Smart Devices I</b></p> <ul style="list-style-type: none"> <li>▪ Overview and introduction</li> <li>▪ Smart devices</li> <li>▪ Technological features</li> <li>▪ Communication and networking</li> <li>▪ User interfaces</li> <li>▪ Ubiquitous computing</li> </ul> <p><b>Smart Devices II</b></p> <ul style="list-style-type: none"> <li>▪ Overview and introduction</li> <li>▪ Smart devices</li> <li>▪ Technological features</li> <li>▪ Communication and networking</li> <li>▪ User interfaces</li> <li>▪ Ubiquitous computing</li> </ul>	
<p><b>Learning Outcomes</b></p> <p><b>Smart Devices I</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ recall the historical development of assistance systems towards smart devices.</li> <li>▪ classify and define different types and examples of smart devices with regard to their properties.</li> <li>▪ know typical features of smart devices.</li> <li>▪ identify different communication standards with which smart devices can communicate with their environment.</li> <li>▪ recognize different approaches with which smart devices can be controlled.</li> <li>▪ classify smart devices as elements of ubiquitous computing.</li> </ul> <p><b>Smart Devices II</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ have an in-depth understanding of the technologies and standards in the context of smart devices.</li> <li>▪ apply technologies in the context of smart devices using a simple practical example.</li> <li>▪ design a hardware or software prototype for a selected task.</li> <li>▪ document design and development activities in the form of a project report.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the fields of Computer Science &amp; Software Development</p>	<p><b>Links to other Study Programs of IUBH</b></p> <p>All Bachelor Programs in the IT &amp; Technology fields</p>



# Smart Devices I

Course Code: DLBINGSD01\_E

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

## 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

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

- Fortino, G./Trunfio, P. (2014): Internet of Things Based on Smart Objects. Technology, Middleware and Applications. Springer International Publishing, Cham.
- López, Tomás Sánchez et al. (2011): Taxonomy, Technology and Applications of Smart Bbjects. In: Information Systems Frontiers, No. 13, Issue 2, p. 281–300.
- McTear, M./Callejas, Z./Griol, D. (2016): The Conversational Interface. Talking to Smart Devices. Springer International Publishing, Cham.
- Nihtianov, S./Luque, A. (2014): Smart Sensors and MEMS. Intelligent Devices and Microsystems for Industrial Applications. Woodhead, Burlington.
- Poslad, S. (2009): Ubiquitous Computing. Smart Devices, Environments and Interactions. 2nd edition, Wiley, Hoboken, NJ.
- Sendler, U. (Ed.) (2018): The Internet of Things – Industrie 4.0 Unleashed. Springer, Berlin.
- Vinoy, K. J. et al. (Ed.) (2014): Micro and Smart Devices and Systems. Springer India, New Delhi.

**Study Format Fernstudium**

<b>Study Format</b> Fernstudium	<b>Course Type</b> Online Lecture
------------------------------------	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Devices II

Course Code: DLBINGS02\_E

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

### 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

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Factory

Module Code: DLBDESEF

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

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

### Module Coordinator

N.N. (Smart Factory I) / Prof. Dr. Christian Magnus (Smart Factory II)

### Contributing Courses to Module

- Smart Factory I (DLBDESEF01)
- Smart Factory II (DLBDESEF02)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Smart Factory I

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

##### Smart Factory II

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

### 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.



**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 IUBH**

All Bachelor Programmes in the IT & Technology fields

# Smart Factory I

Course Code: DLBDESEF01

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

## 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

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

- Bangemann, T. et al. (2016): Integration of Classical Components into Industrial Cyber-Physical Systems. In: Proceedings of the IEEE, 104. Jg., Heft 5, S. 947–959. DOI: 10.1109/JPROC.2015.2510981.
- Bauernhansl, T./Hompel, M. ten/Vogel-Heuser, B. (Hrsg.) (2014): Industrie 4.0 in Produktion, Automatisierung und Logistik. Springer, Berlin.
- Bundesministerium für Wirtschaft und Energie (Hrsg.) (2016): IT-Sicherheit für die Industrie 4.0. Produktion, Produkte, Dienste von morgen im Zeichen globalisierter Wertschöpfungsketten. Berlin.
- Geisberger, E./Broy, M. (Hrsg.) (2012): agendaCPS. Integrierte Forschungsagenda Cyber-Physical Systems. Springer, Berlin/Heidelberg.
- Harrison, R./Vera, D.; Ahmad, B. (2016): Engineering Methods and Tools for Cyber-Physical Automation Systems. In: Proceedings of the IEEE, 104. Jg., Heft 5, S. 973–985. DOI: 10.1109/JPROC.2015.2510665.
- Hauptert, J. (2013): DOMEMan: Repräsentation, Verwaltung und Nutzung von digitalen Objektgedächtnissen. Akademische Verlagsgesellschaft AKA, Berlin.
- VDMA & Partner (2016): Leitfaden Industrie 4.0 Security. Handlungsempfehlungen für den Mittelstand. VDMA Verlag, Frankfurt a. M.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Smart Factory II

Course Code: DLBDESEF02

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

### 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**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBDESEF02



## Smart Mobility

Module Code: DLBINGSM\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### 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

#### Module Exam

#### Split Exam

##### Smart Mobility I

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

##### Smart Mobility II

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

### 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 IUBH**

All Bachelor Programs in the IT & Technology fields

# Smart Mobility I

Course Code: DLBINGSM01\_E

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

## 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****Further Reading**

- Fluegge, B. (2017): Smart Mobility – Connecting Everyone: Trends, Concepts and Best Practices Paperback. Springer/Vierweg, Wiesbaden.
- Handke, V./Jonuschat, H. (2013): Flexible Ridesharing. New Opportunities and Service Concepts for Sustainable Mobility. Springer, Berlin/Heidelberg.
- Inderwildi, O./King, D. (Eds.) (2012): Energy, Transport, & the Environment. Addressing the Sustainable Mobility Paradigm. Springer, London.
- Nathanail, E./Karakikes, I. (2018): Data Analytics: Paving the Way to Sustainable Urban Mobility: Proceedings of 4th Conference on Sustainable Urban Mobility (CSUM2018). Springer, London.
- Papa, R./Fistola, R./Gargiulo, C. (2018): Smart Planning: Sustainability and Mobility in the Age of Change (Green Energy and Technology). Springer, London.
- Planing, P. et al (2020): Innovations for Metropolitan Areas: Intelligent Solutions for Mobility, Logistics and Infrastructure designed for Citizens. Springer, London.
- Sashinskaya, M. (2015): Smart Cities in Europe. Open Data in a Smart Mobility Context. Createspace Independent Publishing Platform.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Mobility II

Course Code: DLBINGSM02\_E

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

### 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**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed



## Smart Services

Module Code: DLBINGSS\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### 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 IUBH**

All Bachelor Programs in the IT & Technology fields

# Smart Services I

Course Code: DLBINGSS01\_E

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

## 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                     |

<b>Literature</b>
-------------------

<b>Compulsory Reading</b>
---------------------------

<b>Further Reading</b>
------------------------

- Chignell, M. et al. (Hrsg.) (2010): The Smart Internet. Current Research and Future Applications. Springer, Berlin.
- Evans, E. (2003): Domain-Driven Design. Tackling Complexity in the Heart of Software. Addison-Wesley, Upper Saddle River, NJ.
- Hohpe, G./Woolf, B./Brown, K. (2012): Enterprise Integration Patterns. Designing, Building, and Deploying Messaging Solutions. 16th edition, Addison-Wesley, Boston, MA.
- Nielsen, L. (2013): Personas – User Focused Design. Springer, London.
- Osterwalder, A/Pigneur, Y. (2010): Business Model Generation: A Handbook for Visionaries, Game Changers, John Wiley & Sons Inc., Hoboken, NJ.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Services II

Course Code: DLBINGSS02\_E

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

### Compulsory Reading

### Further Reading

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed



# Industrial Robotics and Automation

Module Code: DLBROEIRA\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

## Module Coordinator

N.N. (Handling Technology) / N.N. (Automation Technology)

## Contributing Courses to Module

- Handling Technology (DLBROEIRA01\_E)
- Automation Technology (DLBROEIRA02\_E)

## Module Exam Type

### Module Exam

### Split Exam

Handling Technology

- Study Format "Distance Learning": Exam (50)

Automation Technology

- Study Format "Distance Learning": Exam (50)

## Weight of Module

see curriculum

<p><b>Module Contents</b></p> <p><b>Handling Technology</b></p> <ul style="list-style-type: none"> <li>▪ Industrial Handling</li> <li>▪ Delivery systems</li> <li>▪ End effector/manipulator /Gripper</li> <li>▪ Material flow</li> </ul> <p><b>Automation Technology</b></p> <ul style="list-style-type: none"> <li>▪ Modern automation systems</li> <li>▪ Programmable logic controllers</li> <li>▪ Batch automation</li> <li>▪ SCADA</li> <li>▪ Industrial communications</li> <li>▪ Distributed control systems</li> <li>▪ Cyber-security</li> </ul>	
<p><b>Learning Outcomes</b></p> <p><b>Handling Technology</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ assign terms and elements to conventional and flexible automated handling and assembly technology.</li> <li>▪ analyze processes in handling.</li> <li>▪ design methods for the development of assembly and handling tasks.</li> <li>▪ influence component design through analysis, so that production-ready design can commence in the course of the construction phase.</li> </ul> <p><b>Automation Technology</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ understand modern automation systems.</li> <li>▪ identify trends and challenges.</li> <li>▪ design an industrial automation system for an application.</li> <li>▪ name relevant cyber-security issues.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the field of Engineering</p>	<p><b>Links to other Study Programs of IUBH</b></p> <p>All Bachelor Programs in the IT &amp; Technology fields</p>

# Handling Technology

Course Code: DLBROEIRA01\_E

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

## Course Description

In handling, a defined orientation of a geometrically defined object is either created or maintained for a limited time. Typical handling devices, such as industrial robots or handling devices, are program-controlled. This course provides an overview of the standards of conventional handling technology. In addition, the knowledge of flexible handling technology is deepened, with a focus on characteristic pick and place applications and Gripper / Manipulator / Endeffector technology.

## Course Outcomes

On successful completion, students will be able to

- assign terms and elements to conventional and flexible automated handling and assembly technology.
- analyze processes in handling.
- design methods for the development of assembly and handling tasks.
- influence component design through analysis, so that production-ready design can commence in the course of the construction phase.

## Contents

1. Introduction
  - 1.1 Definitions
  - 1.2 Requirements
2. Handling Objects
  - 2.1 Component Regulations
  - 2.2 Component Actions (Stability/Movement Sequences)
  - 2.3 Handling-Oriented Component Design
  - 2.4 Design for manufacturing and assembly
3. Handling Procedures
  - 3.1 Functions
  - 3.2 Illustrations
  - 3.3 Functional Diagrams

4. Standard and Delivery Systems
  - 4.1 Memory
  - 4.2 Motion Systems
  - 4.3 Delivery
  - 4.4 Branching
  - 4.5 Sorting
  - 4.6 Allocation
  - 4.7 Safety Equipment
  - 4.8 Control Systems
  
5. Flexible Handling Technology
  - 5.1 Tasks and Types (IR, Cobot)
  - 5.2 Pick and Place
  - 5.3 Drives
  - 5.4 Gripper technology
  
6. Transfer Systems
  - 6.1 Workpiece Carrier
  - 6.2 Chaining
  
7. Security
  - 7.1 Technical Safety Requirements
  - 7.2 Malfunction During Operation

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

- Haun, M. (2013): Handbuch Robotik. Programmieren und Einsatz intelligenter Roboter. 2. Auflage, Springer Vieweg Verlag, Berlin.
- Hesse, S. (2016): Grundlagen der Handhabungstechnik. 4., überarbeitete und erweiterte Auflage, Carl Hanser Verlag, München.
- Hesse, S. (2016): Taschenbuch. Robotik - Montage – Handhabung. 2., neu bearbeitete Auflage, Carl Hanser Verlag, München.
- Maier, H. (2016): Grundlagen der Robotik. VDE Verlag GmbH, Berlin.
- Wolf, A./Schunk, H. (2016): Greifer in Bewegung. Faszination der Automatisierung von Handhabungsaufgaben. 2. Auflage, Carl Hanser Verlag, München.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

# Automation Technology

Course Code: DLBROEIRA02\_E

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

## Course Description

Automation technology refers to the analysis, design and improvement of existing or new automation systems. Modern automation systems are characterized by the combination of many different devices, such as actuators, sensors, machines, which must be able to perform a coordinate action and to exchange data with each other. This course introduces such modern automation systems by listing their necessary components, presenting current challenges and trends and explaining communication technologies to build effective industrial automation networks. A brief overview on the topic of cyber-security is also given.

## Course Outcomes

On successful completion, students will be able to

- understand modern automation systems.
- identify trends and challenges.
- design an industrial automation system for an application.
- name relevant cyber-security issues.

## Contents

1. Introduction
  - 1.1 Evolution of Automation
  - 1.2 Industrial Revolutions
  - 1.3 Modern Automation Systems
  - 1.4 Challenges and Trends
2. An Introduction to Programmable Logic Controllers
  - 2.1 Hardware
  - 2.2 Internal Architecture
  - 2.3 I/O
  - 2.4 Ladder and Functional Block Programming
  - 2.5 Programming Methods
3. Batch Automation
  - 3.1 Basics
  - 3.2 Applications

4. SCADA Systems
  - 4.1 Overview
  - 4.2 Components
  - 4.3 Communication Technologies
  - 4.4 Interfaces
5. Industrial Communication Technologies
  - 5.1 Industrial Networks
  - 5.2 HART
  - 5.3 PROFIBUS
  - 5.4 Wireless Communication
  - 5.5 OPC
  - 5.6 Konnex (EIB/KNX)
  - 5.7 LonWorks®
6. Distributed Control System
  - 6.1 Evolution of Control Systems
  - 6.2 Components of Distributed Control Systems
7. Cyber Security in Industrial Automation
  - 7.1 Plant Control Network
  - 7.2 Cyber Attacks
  - 7.3 Common Industrial Software Weaknesses

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

- Gupta, A. K./Arora, S. K./Westcott, J. R. (2016): Industrial automation and robotics. Mercury Learning & Information, Herndon, VA.
- Mehta, B. R./Reddy, Y. J. (2014): Industrial process automation systems: Design and implementation. Elsevier Inc, Amsterdam.
- Merz, H./Hansemann, T./Hübner, C. (2018): Building Automation. Springer International Publishing, Cham.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed



## Service Robotics

Module Code: DLBROESR\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

N.N. (Mobile Robotics) / N.N. (Soft Robotics)

### Contributing Courses to Module

- Mobile Robotics (DLBROESR01\_E)
- Soft Robotics (DLBROESR02\_E)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Mobile Robotics

- Study Format "Distance Learning": Module Exam (50)

##### Soft Robotics

- Study Format "Distance Learning": Exam (50)

### Weight of Module

see curriculum

**Module Contents****Mobile Robotics**

- Locomotion
- Kinematics and dynamics
- Perception
- Mobile manipulators
- Path motion and task planning
- Localization and mapping

**Soft Robotics**

- Soft robotics
- Actuators for soft robots
- Sensors for soft robots
- Applications of soft robots

**Learning Outcomes****Mobile Robotics**

On successful completion, students will be able to

- understand mobile robot locomotion, kinematics, and dynamics.
- model and simulate a wheeled, legged, or aerial mobile robot.
- understand common approaches for localization and mapping.
- apply and simulate path, motion, and task planning algorithms.
- simulate and understand mobile manipulators.

**Soft Robotics**

On successful completion, students will be able to

- know the basics behind soft robots.
- understand and analyze common structures of soft robots.
- choose the best soft robot technology for a given application.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the IT & Technology fields

# Mobile Robotics

Course Code: DLBROESR01\_E

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

## Course Description

Modern robots are mobile robots, able to move in spaces and perform tasks autonomously. This is for instance what is done by household robots, or by robots working in warehouses. In the last years, such robots have been improved by the implementation of advanced localization and task planning algorithms, which are based on the fundamentals of mobile robot kinematics and dynamics. This course starts with an introduction to the main concepts of robot locomotion, presenting the three main categories of mobile robots, namely legged, wheeled and aerial (often called drones). As second focus lies on the necessary mathematical foundation. This course, thus, discusses kinematics and dynamics of mobile robots. The topic of how a mobile robot can perceive the surrounding world is treated in detail in a third part of this course, where sensors for mobile robots are introduced together with an introduction on advanced topics such as robot vision and image processing. The last part of this course describes the main approaches for localization, mapping and motion and task planning. A brief overview on combination of mobile robots and manipulators, i.e., mobile manipulators, is also given.

## Course Outcomes

On successful completion, students will be able to

- understand mobile robot locomotion, kinematics, and dynamics.
- model and simulate a wheeled, legged, or aerial mobile robot.
- understand common approaches for localization and mapping.
- apply and simulate path, motion, and task planning algorithms.
- simulate and understand mobile manipulators.

## Contents

1. Locomotion
  - 1.1 Basics
  - 1.2 Legged Mobile Robots
  - 1.3 Wheeled Mobile Robots
  - 1.4 Aerial Mobile Robots

2. Kinematics
  - 2.1 Basics
  - 2.2 Kinematic Models and Constraints
  - 2.3 Mobile Robot Maneuverability
  - 2.4 Mobile Robot Workspace
  - 2.5 Applications
3. Dynamics
  - 3.1 Basics
  - 3.2 Dynamic Modeling
  - 3.3 Examples
4. Perception
  - 4.1 Sensors for Mobile Robots
  - 4.2 Position and Velocity Sensors
  - 4.3 Accelerometers
  - 4.4 Inertial Measurement Unit
  - 4.5 Distance Sensors
  - 4.6 Vision Sensors
  - 4.7 Robot Vision and Image Processing
  - 4.8 Global Positioning System
5. Mobile Manipulators
  - 5.1 Basics
  - 5.2 Modeling
  - 5.3 Examples
6. Path, Motion and Task Planning
  - 6.1 Basics
  - 6.2 Path Planning
  - 6.3 Motion Planning
  - 6.4 Task Planning

7. Localization and Mapping
  - 7.1 Sensor Imperfections
  - 7.2 Relative Localization
  - 7.3 Absolute Localization
  - 7.4 Localization, Calibration and Sensor Fusion
  - 7.5 Simultaneous Localization and Mapping
  - 7.6 Examples

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

- Corke, P. (2017): Robotics, Vision and Control: Fundamental Algorithms In MATLAB. 2nd ed., Springer International Publishing, Cham.
- Siciliano, B./Khatib, O. (eds.) (2016): Springer Handbook of Robotics. Springer International Publishing, Cham.
- Siegwart, R./Nourbakhsh, I. R./Scaramuzza, D. (2011): Introduction to Autonomous Mobile Robots. The MIT Press, Cambridge, MS.
- Tzafestas, S. G. (2013): Introduction to Mobile Robot Control. Elsevier Inc, Amsterdam.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Module Exam

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

# Soft Robotics

Course Code: DLBROESR02\_E

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

## Course Description

Classic robots are made of rigid links and structures. In the last years, the field of robotics has been strongly influenced and inspired by biological processes. Instead of rigid structures, soft structures, materials, and surfaces are characterizing innovative, soft robots. This new generation of robots can be used in several applications where highly dynamic tasks must be performed in unsafe or rough environments, and especially where the interaction with humans is necessary. This course provides the basics in the fast-changing field of soft robotics, starting with an overview of materials and technologies for soft actuators, proceeding with an overview on innovative sensors, and concluding with an overview on modeling approaches for soft robots. The last part summarizes some relevant state-of-the-art applications.

## Course Outcomes

On successful completion, students will be able to

- know the basics behind soft robots.
- understand and analyze common structures of soft robots.
- choose the best soft robot technology for a given application.

## Contents

1. Introduction
  - 1.1 Soft Robots
  - 1.2 Challenges
  - 1.3 Trends
  - 1.4 Applications
2. Actuators
  - 2.1 Materials and Properties of Soft Actuators
  - 2.2 Thermo-driven Soft Actuators
  - 2.3 Electro-driven Soft Actuators
  - 2.4 Light-driven Soft Actuators
  - 2.5 Magneto-driven Soft Actuators
  - 2.6 Pneumatic Actuators
  - 2.7 Examples

3. Sensors
  - 3.1 Basics
  - 3.2 Proximity Sensing
  - 3.3 Mechano-sensing
  - 3.4 Examples
4. Modeling
  - 4.1 Artificial Muscles
  - 4.2 Interactions
  - 4.3 Compliance Control
  - 4.4 Variable-stiffness Actuators
5. Applications
  - 5.1 Soft Bionic Hands
  - 5.2 Healthcare and Surgery
  - 5.3 Underwater and Aquatic Propulsion
  - 5.4 Bio-inspired Aerial Robots

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

- Asaka, K./Okuzaki, H. (eds.) (2019): Soft actuators: materials, modeling, applications, and future perspectives. Springer, Singapore.
- Kim, J. (2017): Microscale Soft Robotics. Springer International Publishing, Cham.
- Siciliano, B./Khatib, O. (eds.) (2016): Springer Handbook of Robotics. Springer International Publishing, Cham.
- Verl, A., et al (eds.) (2015): Soft Robotics: Transferring Theory to Application. Soft Robotics. Springer, Berlin.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLBROESR02\_E

# Introduction to Cognitive Robotics

Module Code: DLBROEICR\_E

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

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

## Module Coordinator

N.N. (Digital Signal Processing) / N.N. (Fundamentals of NLP and Computer Vision)

## Contributing Courses to Module

- Digital Signal Processing (DLBROEICR01\_E)
- Fundamentals of NLP and Computer Vision (DLBROEICR02\_E)

## Module Exam Type

### Module Exam

### Split Exam

#### Digital Signal Processing

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

#### Fundamentals of NLP and Computer Vision

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

## Weight of Module

see curriculum

**Module Contents****Digital Signal Processing**

- Signal sampling and quantization
- Digital signals and systems
- Discrete Fourier Transform
- z-Transform
- Digital signal processing and filters

**Fundamentals of NLP and Computer Vision**

- Introduction to Natural Language Processing
- Introduction to Computer Vision
- Applications to Robotics

**Learning Outcomes****Digital Signal Processing**

On successful completion, students will be able to

- analyze discrete time systems.
- apply analysis tools such as the Discrete Fourier Transform.
- apply the z-Transform.
- analyze properties of discrete systems.
- design finite and infinite impulse response filters.
- implement filters in hardware and software.

**Fundamentals of NLP and Computer Vision**

On successful completion, students will be able to

- name central problems and challenges in natural language processing and computer vision.
- understand common methods used in natural language processing and computer vision.
- name common use-case scenarios in which NLP and computer vision techniques are applied.
- design basic language processing and computer vision solutions for use in robotics.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the IT & Technology fields

# Digital Signal Processing

Course Code: DLBROEICR01\_E

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

## Course Description

Digital signal processing enables digital audio and video extraction, as well as extraction of important features from any other kind of signal, for instance medical imagery or diagnostic tools. This course provides the students with expertise on the theory and practice of digital signal processing. In the first part, theoretical concepts are introduced, presenting the main tools for analysis of digital, i.e., sampled or discrete-time systems. The core of digital signal processing resides in the design of a digital filter. The second part of the course focuses on different filter-design approaches, i.e. a discussion on finite impulse response and infinite impulse response filters. The last part gives important insights into the hardware and software implementation of digital signal processing, bridging theory with applied practice.

## Course Outcomes

On successful completion, students will be able to

- analyze discrete time systems.
- apply analysis tools such as the Discrete Fourier Transform.
- apply the z-Transform.
- analyze properties of discrete systems.
- design finite and infinite impulse response filters.
- implement filters in hardware and software.

## Contents

1. Introduction
  - 1.1 Basic Concepts
  - 1.2 Applications
2. Signal Sampling and Quantization
  - 2.1 Sampling
  - 2.2 Signal reconstruction
  - 2.3 Analog-to-digital Conversion
  - 2.4 Digital-to-Analog Conversion
  - 2.5 Quantization

3. Digital Signals and Systems
  - 3.1 Digital Signals
  - 3.2 Difference Equations and Impulse Responses
  - 3.3 BIBO-Stability
  - 3.4 Digital Convolution
4. Discrete Fourier Transform
  - 4.1 Discrete Fourier Transform
  - 4.2 Amplitude and Power Spectrum
  - 4.3 Spectral Estimation
5. The z-Transform
  - 5.1 Definition
  - 5.2 Properties
  - 5.3 Inverse z-Transform
  - 5.4 Solution of Difference Equations
6. Digital Signal Processing Systems and Filters
  - 6.1 Difference Equation and Transfer Function
  - 6.2 Poles, Zeros and Stability
  - 6.3 Digital Filter Frequency Response
  - 6.4 Basic Filtering
  - 6.5 Realization of Digital Filters
  - 6.6 Applications
7. Finite Impulse Response Filter Design
  - 7.1 Basics
  - 7.2 Fourier Transform Design
  - 7.3 Window Method
  - 7.4 Frequency Sampling Design Method
  - 7.5 Optimal Design Method
  - 7.6 Applications

8. Infinite Impulse Response Filter Design
  - 8.1 Basics
  - 8.2 Bilinear Transformation Design Method
  - 8.3 Butterworth and Chebyshev Filter Designs
  - 8.4 Higher-Order Infinite Impulse Response Filter Design
  - 8.5 Pole-Zero Placement for Simple Filters
  - 8.6 Applications
9. Hardware and Software for Digital Signal Processing
  - 9.1 Digital Signal Processor Architecture
  - 9.2 Digital Signal Processor Hardware Units
  - 9.3 Fixed-Point and Floating-Point Formats
  - 9.4 Implementation of FIR and IIR Filters in Fixed-Point
  - 9.5 DSP Programming Examples

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

- Manolakis, D. G./Ingle, V. K. (2011): Applied digital signal processing: theory and practice. Cambridge University Press, Cambridge.
- Tan, L./Jiang, J. (2013): Digital signal processing: fundamentals and applications. 2nd ed., Academic Press, Cambridge, MS.
- Vetterli, M./Kovačević, J./Goyal, V. K. (2014): Foundations of signal processing. 2nd ed., Cambridge University Press, Cambridge.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed



# Fundamentals of NLP and Computer Vision

Course Code: DLBROEICR02\_E

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

## Course Description

Innovative robots, belonging to the so-called generation 3.0, need to sense and understand the environment in many ways, for instance using vision and language understanding and processing. This course introduces the topics of natural language processing (NLP) and computer vision, discussing the main techniques of both fields as well as their application in the field of robotics.

## Course Outcomes

On successful completion, students will be able to

- name central problems and challenges in natural language processing and computer vision.
- understand common methods used in natural language processing and computer vision.
- name common use-case scenarios in which NLP and computer vision techniques are applied.
- design basic language processing and computer vision solutions for use in robotics.

## Contents

1. Introduction to NLP
  - 1.1 History
  - 1.2 Basics Concepts of NLP
  - 1.3 Feature Extraction Methods
2. Applications of NLP
  - 2.1 Topic Modeling
  - 2.2 Text Summarization and Generation
  - 2.3 Sentiment Analysis
  - 2.4 Translation
  - 2.5 Chatbots
3. Introduction to Computer Vision
  - 3.1 Light and Color
  - 3.2 Image Formation
  - 3.3 Image Processing
  - 3.4 Image Feature Extraction
  - 3.5 Stereo Vision

4. Applications of Computer Vision
  - 4.1 Image Classification, Motion Tracking
  - 4.2 Semantic Segmentation
  - 4.3 Object Identification and Tracking
  - 4.4 Eigenfaces and Facial Recognition
  
5. NLP and Computer Vision in Robotics
  - 5.1 Camera Calibration
  - 5.2 Pose Estimation
  - 5.3 Visual Servoing
  - 5.4 Human-Robot Interaction
  - 5.5 Privacy Issues

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

- Bird S., Klein, E./Loper, E. (2009): Natural language processing with Python. 2nd ed., O'Reilly, Sebastopol, CA.
- Fisher, R. B., et al (2016) : Dictionary of computer vision and image processing. John Wiley & Sons, Chichester.
- Jurafsky, D./Martin, J. H. (2008): Speech and language processing. Prentice Hall, Upper Saddle River, NJ.
- Szelski, R. (2011): Computer vision: Algorithms and applications. 2nd ed., Springer VS, Wiesbaden.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLBROEICR02\_E

# Programming of Robotic Systems

Module Code: DLBROEPRS\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

## Module Coordinator

N.N. (Programming with C/C++) / N.N. (Programming PLCs)

## Contributing Courses to Module

- Programming with C/C++ (DLBROEPRS01\_E)
- Programming PLCs (DLBROEPRS02\_E)

## Module Exam Type

### Module Exam

### Split Exam

Programming with C/C++

- Study Format "Fernstudium": Portfolio

Programming PLCs

- Study Format "Fernstudium": Oral Assignment

## Weight of Module

see curriculum

<p><b>Module Contents</b></p> <p><b>Programming with C/C++</b></p> <ul style="list-style-type: none"> <li>▪ C and C++ for programming of applications and robots</li> </ul> <p><b>Programming PLCs</b></p> <ul style="list-style-type: none"> <li>▪ Architectures of programmable logic controllers</li> <li>▪ Ladder and Functional Block Programming</li> <li>▪ IL, SFC and ST Programming Methods</li> <li>▪ Elements of PLC programming</li> <li>▪ Applications of PLC programming</li> </ul>	
<p><b>Learning Outcomes</b></p> <p><b>Programming with C/C++</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ know the main characteristics of C and C++ programming languages.</li> <li>▪ apply C and C++ for programming of applications.</li> <li>▪ apply C and C++ for programming of robotic systems.</li> </ul> <p><b>Programming PLCs</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ understand the architecture of PLC systems.</li> <li>▪ program PLC devices.</li> <li>▪ apply PLC programming methods for control of simple processes.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the fields of Computer Science &amp; Software Development</p>	<p><b>Links to other Study Programs of IUBH</b></p> <p>All Bachelor Programmes in the IT &amp; Technology fields</p>

## Programming with C/C++

Course Code: DLBROEPRS01\_E

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

### Course Description

C and C++ belong to the class of programming languages which have been adopted in a broad field of applications, ranging from embedded systems (where they are dominant) to fast and reliable user interfaces and industrial applications. In fact, C++ is one of the most popular legacy programming languages for robotics, and a combination of C++ and robotics hardware is used in many leading industries. Knowledge on how to design in and write C/C++ code is an imperative capability for the practicing roboticist, especially in the industrial arena.

### Course Outcomes

On successful completion, students will be able to

- know the main characteristics of C and C++ programming languages.
- apply C and C++ for programming of applications.
- apply C and C++ for programming of robotic systems.

### Contents

- This course introduces the main aspects of C and C++ programming languages, such as data types, variables, arithmetic expressions, flow control, functions, classes, arrays, and pointers. The programming skills will then be applied to design parts of robotic systems based on popular hardware.

### Literature

#### Compulsory Reading

#### Further Reading

- Čukić, I. (2018): Functional programming in C++. Manning, Shelter Island, NY.
- Laaksonen, A. (2017): Guide to Competitive Programming. Springer International Publishing, Cham.
- Siegesmund, M. (2014): Embedded C Programming. Elsevier Inc, Amsterdam.
- Stroustrup, B. (2013): The C++ Programming Language. 4th ed., Addison-Wesley Professional, Amsterdam.
- Tavasalkar, D. (2019): Hands-On Robotics Programming with C ++. Packt Publishing, Birmingham.

**Study Format Fernstudium**

<b>Study Format</b> Fernstudium	<b>Course Type</b> Project
------------------------------------	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Portfolio

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed



# Programming PLCs

Course Code: DLBROEPRS02\_E

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

## Course Description

Programmable logic controllers (PLCs) are used extensively for industrial automation in modern factories and smart houses, either as compact controllers, modular controllers or distributed controllers. PLC algorithms are developed using specific programming languages created for the particular PLC. This course introduces the purpose, architecture, and programming methods of modern PLC systems for use in industrial automation and robotics.

## Course Outcomes

On successful completion, students will be able to

- understand the architecture of PLC systems.
- program PLC devices.
- apply PLC programming methods for control of simple processes.

## Contents

1. Introduction
  - 1.1 Programmable Logic Controllers
  - 1.2 Hardware
  - 1.3 PLC Architecture
  - 1.4 PLC Systems
  - 1.5 Trends
2. Digital Systems
  - 2.1 The Binary, Octal and Hexadecimal Systems
  - 2.2 Binary Arithmetic
  - 2.3 PLC Data Types
  - 2.4 Combinational and Sequential Logic

3. I/O Processing
  - 3.1 Input/Output Units
  - 3.2 Signal Conditioning
  - 3.3 Remote Connections
  - 3.4 Networks
  - 3.5 I/O addresses
  
4. Ladder and Functional Block Programming
  - 4.1 Ladder Diagrams
  - 4.2 Logic Functions
  - 4.3 Latching
  - 4.4 Multiple Outputs
  - 4.5 Entering Programs
  - 4.6 Function Blocks
  - 4.7 Examples
  
5. IL, SFC and ST Programming Methods
  - 5.1 Instruction List
  - 5.2 Sequential Function Charts
  - 5.3 Structured Text
  - 5.4 Examples
  
6. Elements of PLC Programming
  - 6.1 Internal Relays
  - 6.2 Jump and Call
  - 6.3 Timers
  - 6.4 Counters
  - 6.5 Shift Registers
  - 6.6 Data Handling
  
7. Applications
  - 7.1 PLC and Safety
  - 7.2 Testing Software and Fault Finding
  - 7.3 Examples of Process Control

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

- Barkalov, A./Titarenko, L./Mazurkiewicz, M. (2019): Foundations of Embedded Systems. Springer International Publishing, Cham.
- Bolton, W. (2015): Programmable logic controllers. 6th ed., Newnes/Elsevier, Amsterdam.
- Petruzella, F. D. (2016): Programmable logic controllers. 5th ed., McGraw-Hill Education, New York City, NY.

**Study Format Fernstudium**

<b>Study Format</b> Fernstudium	<b>Course Type</b> Online Lecture
------------------------------------	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Oral Assignment

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## AI Specialist

Module Code: DLBDSEAIS

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

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

### 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

#### Module Exam

#### Split Exam

##### Artificial Intelligence

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

##### Project: Artificial Intelligence

- Study Format "Fernstudium": Portfolio

### 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 IUBH**

All Bachelor Programmes in the IT & Technology fields

# Artificial Intelligence

Course Code: DLBDSEAIS01

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

## 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

- Bear, F./Barry, W./Paradiso, M. (2006): Neuroscience: Exploring the brain. 3rd ed., Lippincott Williams and Wilkins, Baltimore, MD:
- Bird S./Klein, E./Loper, E. (2009): Natural language processing with Python. 2nd ed., O'Reilly, Sebastopol, CA.
- Chollet, F. (2017): Deep learning with Python. Manning, Shelter Island, NY.
- Fisher, R. B., et al. (2016) : Dictionary of computer vision and image processing. John Wiley & Sons, Chichester.
- Geron, A. (2017): Hands-on machine learning with Scikit-Learn and TensorFlow. O'Reilly, Boston, MA.
- Goodfellow, I./Bengio, Y./Courville, A. (2016): Deep learning. MIT Press, Boston, MA.
- Grus, J. (2019): Data science from scratch: First principles with Python. O'Reilly, Sebastopol, CA.
- Jurafsky, D./Martin, J. H. (2008): Speech and language processing. Prentice Hall, Upper Saddle River, NJ.
- Nilsson, N. (2009): The quest for artificial intelligence. Cambridge University Press, Cambridge.
- Russell, S./Norvig, P. (2009): Artificial intelligence: A modern approach. 3rd ed., Pearson, Essex.
- Sutton, R./Barto, A. (2018): Reinforcement learning: An introduction. 2nd ed., MIT Press, Boston, MA.
- Szelski, R. (2011): Computer vision: Algorithms and applications. 2nd ed., Springer VS, Wiesbaden.
- Szepesvári, C. (2010): Algorithms for reinforcement learning. Morgan & Claypool, San Rafael, CA.
- Wiering, M./Otterlo, M. (2012): Reinforcement learning: State of the art. Springer, Berlin.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Project: Artificial Intelligence

Course Code: DLBDSEAIS02

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

### 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.

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

- Bear, F./Barry, W./Paradiso, M. (2006): Neuroscience: Exploring the brain. 3rd ed., Lippincott Williams and Wilkins, Baltimore, MD:
- Bird S./Klein, E./Loper, E. (2009): Natural language processing with Python. 2nd ed., O'Reilly, Sebastopol, CA.
- Chollet, F. (2017): Deep learning with Python. Manning, Shelter Island, NY.
- Fisher, R. B., et al. (2016) : Dictionary of computer vision and image processing. John Wiley & Sons, Chichester.
- Geron, A. (2017): Hands-on machine learning with Scikit-Learn and TensorFlow. O'Reilly, Boston, MA.
- Goodfellow, I./Bengio, Y./Courville, A. (2016): Deep learning. MIT Press, Boston, MA.
- Grus, J. (2019): Data science from scratch: First principles with Python. O'Reilly, Sebastopol, CA.
- Jurafsky, D./Martin, J. H. (2008): Speech and language processing. Prentice Hall, Upper Saddle River, NJ.
- Nilsson, N. (2009): The quest for artificial intelligence. Cambridge University Press, Cambridge.
- Russell, S./Norvig, P. (2009): Artificial intelligence: A modern approach. 3rd ed., Pearson, Essex.
- Sutton, R./Barto, A. (2018): Reinforcement learning: An introduction. 2nd ed., MIT Press, Boston, MA.
- Szelski, R. (2011): Computer vision: Algorithms and applications. 2nd ed., Springer VS, Wiesbaden.
- Szepesvári, C. (2010): Algorithms for reinforcement learning. Morgan & Claypool, San Rafael, CA.
- Wiering, M./Otterlo, M. (2012): Reinforcement learning: State of the art. Springer, Berlin.

**Study Format Fernstudium**

<b>Study Format</b> Fernstudium	<b>Course Type</b> Project
------------------------------------	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Portfolio

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Autonomous Driving

Module Code: DLBDSEAD

Module Type	Admission Requirements	Study Level	CP	Student Workload
see curriculum	none	BA	10	150 h

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

### Module Coordinator

N.N. (Self-Driving Vehicles) / N.N. (Seminar: Current Topics and Trends in Self-Driving Technology)

### Contributing Courses to Module

- Self-Driving Vehicles (DLBDSEAD01)
- Seminar: Current Topics and Trends in Self-Driving Technology (DLBDSEAD02)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Self-Driving Vehicles

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

##### Seminar: Current Topics and Trends in Self-Driving Technology

- Study Format "Distance Learning": Written Assessment: Research Essay (50)

### Weight of Module

see curriculum

**Module Contents****Self-Driving Vehicles**

- Safety standards
- Sensor fusion
- Computer vision
- Localization & motion
- Motion planning

**Seminar: Current Topics and Trends in Self-Driving Technology**

The seminar covers current topics of autonomous vehicles. The choice of topics can include (but are not limited to) recent technical advances as well as philosophical issues or implications for society, law, or relevant industries.

**Learning Outcomes****Self-Driving Vehicles**

On successful completion, students will be able to

- cite relevant safety standards.
- grasp the concepts of sensors and sensor fusion.
- apply computer vision techniques to detect features.
- evaluate images in terms of semantic segmentation.
- understand motion models and localization approaches.
- utilize motion planning techniques.

**Seminar: Current Topics and Trends in Self-Driving Technology**

On successful completion, students will be able to

- transfer theoretical knowledge and methods to new domains.
- understand recent developments in self-driving vehicles.
- create new insights based on detailed studies of current research and technology.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the IT & Technology fields

# Self-Driving Vehicles

Course Code: DLBDSEAD01

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

## Course Description

This course focuses on the foundations of autonomous vehicles and starts with a detailed introduction to relevant safety standards in terms of functional and IT security. This course continues with a presentation of the concept of sensor fusion and discusses relevant aspects of computer vision techniques such as feature detection, calibration, and semantic segmentation. A large part of the course concerns localization and motion planning. Relevant motion models are introduced and localization techniques such as odometry, triangulation, and satellite-based systems are discussed in detail, along with path planning, motion prediction, and trajectory generation.

## Course Outcomes

On successful completion, students will be able to

- cite relevant safety standards.
- grasp the concepts of sensors and sensor fusion.
- apply computer vision techniques to detect features.
- evaluate images in terms of semantic segmentation.
- understand motion models and localization approaches.
- utilize motion planning techniques.

## Contents

1. Sensors
  - 1.1 Physical principles of sensors
  - 1.2 Types of sensors
  - 1.3 Sensor calibration
  - 1.4 Application scenarios
2. Sensor Fusion
  - 2.1 Elaborating data from sensors
  - 2.2 Kalman filter
  - 2.3 Object tracking

3. Computer Vision
  - 3.1 Pixels and filters
  - 3.2 Feature detection
  - 3.3 Distortions and calibration
  - 3.4 Semantic segmentation
4. Localization & Motion
  - 4.1 Motion models
  - 4.2 Odometry
  - 4.3 Triangulation
  - 4.4 Satellite-based localization
5. Motion planning
  - 5.1 Path planning
  - 5.2 Motion prediction
  - 5.3 Trajectory generation
6. Safety Standards
  - 6.1 Functional Safety
  - 6.2 IT Security Standards
  - 6.3 Safety development approaches



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

- Ben-Ari, M./Mondada, F. (2018): Elements of robotics. Springer, Cham.
- European Union. (2001): Directive 2001/95/EG. (URL: <https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32001L0095> [Retrieved: 28.02.2020])
- Fisher, R. B., et al. (2016): Dictionary of computer vision and image processing. John Wiley & Sons, Chichester.
- International Electrotechnical Commission. (2015): IEC 61508. (URL: <https://www.iec.ch/functionalsafety/> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2009): ISO 15408. (URL: <https://www.iso.org/standard/50341.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2018): ISO 25119. (URL: <https://www.iso.org/standard/69026.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2018): ISO 26262. (URL: <https://www.iso.org/standard/68383.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (n.d.): ISO 21434. (URL: <https://www.iso.org/standard/70918.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2018): ISO/IEC 27001. (URL: <https://www.iso.org/isoiec-27001-information-security.html> [Retrieved: 28.02.2020])
- Rausand, M. (2014): Reliability of safety-critical systems: Theory and applications. Wiley, Hoboken, NJ.
- Smith, D. J./Simpson, K. (2016): The safety critical systems handbook. 4th ed., Elsevier, Oxford.
- Smith, D. J. (2017): Reliability, maintainability and risk. 9th ed., Elsevier, Oxford.
- Society of Automobile Engineers International. (2012): SAE J3061. (URL: <https://www.sae.org/standards/content/j3061/> [Retrieved: 28.02.2020])
- Szelski, R. (2011): Computer vision: Algorithms and applications. 2nd ed., Springer VS, Wiesbaden.
- Wang, P. K.-C. (2015): Visibility-based optimal path and motion planning (vol. 568). Springer, Cham.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

# Seminar: Current Topics and Trends in Self-Driving Technology

Course Code: DLBDSEAD02

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

## Course Description

This course focuses on recent developments in the field of self-driving vehicles. Following the course Self-Driving Vehicles (DLBDSEAD01), in this course students will focus on a particular topic in the context of autonomous driving, applying the knowledge they have obtained in the first course. Finally, a research essay will be written.

## Course Outcomes

On successful completion, students will be able to

- transfer theoretical knowledge and methods to new domains.
- understand recent developments in self-driving vehicles.
- create new insights based on detailed studies of current research and technology.

## Contents

- The seminar covers current topics of autonomous vehicles. The choice of topics can include (but are not limited to) recent technical advances as well as philosophical issues or implications for society, law, or relevant industries.

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

- Ben-Ari, M./Mondada, F. (2018): Elements of robotics. Springer, Cham.
- European Union. (2001): Directive 2001/95/EG. (URL: <https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32001L0095> [Retrieved: 28.02.2020])
- Fisher, R. B., et al. (2016): Dictionary of computer vision and image processing. John Wiley & Sons, Chichester.
- International Electrotechnical Commission. (2015): IEC 61508. (URL: <https://www.iec.ch/functionalsafety/> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2009): ISO 15408. (URL: <https://www.iso.org/standard/50341.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2018): ISO 25119. (URL: <https://www.iso.org/standard/69026.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2018): ISO 26262. (URL: <https://www.iso.org/standard/68383.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (n.d.): ISO 21434. (URL: <https://www.iso.org/standard/70918.html> [Retrieved: 28.02.2020])
- International Organization for Standardization. (2018): ISO/IEC 27001. (URL: <https://www.iso.org/isoiec-27001-information-security.html> [Retrieved: 28.02.2020])
- Marchthaler, R./Dingler, S. (2017): Kalman-Filter. Springer, Wiesbaden.
- Rausand, M. (2014): Reliability of safety-critical systems: Theory and applications. Wiley, Hoboken, NJ.
- Smith, D. J./Simpson, K. (2016): The safety critical systems handbook. 4th ed., Elsevier, Oxford.
- Smith, D. J. (2017): Reliability, maintainability and risk. 9th ed., Elsevier, Oxford.
- Society of Automobile Engineers International. (2012): SAE J3061. (URL: <https://www.sae.org/standards/content/j3061/> [Retrieved: 28.02.2020])
- Szelski, R. (2011): Computer vision: Algorithms and applications. 2nd ed., Springer VS, Wiesbaden.
- Wang, P. K.-C. (2015): Visibility-based optimal path and motion planning (vol. 568). Springer, Cham.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Seminar
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Research Essay

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBDSEAD02

# Foundations of Programming with Python

Module Code: DLBBUEFPP

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

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

## Module Coordinator

Dr. Reza Shahbazfar (Introduction to Programming with Python) / Prof. Dr. Max Pumperla (Object oriented and functional programming in Python)

## Contributing Courses to Module

- Introduction to Programming with Python (DLBDSIPWP01)
- Object oriented and functional programming in Python (DLBDSOOFPP01)

## Module Exam Type

### Module Exam

### Split Exam

Introduction to Programming with Python

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

Object oriented and functional programming in Python

- Study Format "Distance Learning": Portfolio (50)

## Weight of Module

see curriculum

### Module Contents

#### Introduction to Programming with Python

- Introduction
- Variables and Data Types
- Statements
- Functions
- Errors and Exceptions
- Modules and Packages

#### 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 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.

#### 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 IUBH

All Bachelor Programs in the IT & Technology fields



# Introduction to Programming with Python

Course Code: DLBDSIPWP01

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

## 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

- Barry, P. (2016): Head first Python: A brain-friendly guide. 2nd ed., O'Reilly, Sebastopol, CA.
- Lubanovic, B. (2019): Introducing Python. 2nd ed., O'Reilly, Sebastopol, CA.
- Lutz, M. (2013): Learning Python. 5th ed., O'Reilly, Sebastopol, CA.
- Matthes, E. (2019): Python crash course: A hands-on, project-based introduction to programming. 2nd ed., No Starch Press, San Francisco, CA.
- Ramalho, L. (2015): Fluent Python: Clear, concise, and effective programming. O'Reilly, Sebastopol, CA.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Object oriented and functional programming in Python

Course Code: DLBDSOOFPP01

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

### 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**

- Lott, S. F. (2018): Functional Python programming: Discover the power of functional programming, generator functions, lazy evaluation, the built-in itertools library, and monads. 2nd ed., Packt Publishing, Birmingham.
- Lutz, M. (2013): Learning Python. 5th ed., O'Reilly, Sebastopol, CA.
- Phillips, D. (2018): Python 3 object-oriented programming: Build robust and maintainable software with object-oriented design patterns in Python 3.8. 3rd ed., Packt Publishing, Birmingham.
- Ramalho, L. (2015): Fluent Python: Clear, concise, and effective programming. O'Reilly, Sebastopol, CA.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Portfolio

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## IT project and architecture management

Module Code: DLBCSEITPAM

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

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

### Module Coordinator

N.N. (IT Project Management) / N.N. (IT Architecture Management)

### Contributing Courses to Module

- IT Project Management (DLBCSEITPAM01)
- IT Architecture Management (DLBCSEITPAM02)

### Module Exam Type

#### Module Exam

#### Split Exam

##### IT Project Management

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

##### IT Architecture Management

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

### Weight of Module

see curriculum

**Module Contents****IT Project Management**

- 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

**IT Architecture Management**

- 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 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.

**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(s) of Computer Science & Software Development.

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the IT & Technology field(s).

# IT Project Management

Course Code: DLBCSEITPAM01

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

## 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

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

- Berkun, S. (2009): Die Kunst des IT-Projektmanagements. 2. Auflage, O'Reilly, Sebastopol, CA.
- DeMarco, T. (2003): Bärenango. Mit Risikomanagement Projekte zum Erfolg führen. Carl Hanser Verlag, München.
- Geirhos, M. (2011): IT-Projektmanagement. Was wirklich funktioniert – und was nicht. Galileo Computing, Bonn.
- Höhn, R./Höppner S. (2008): Das V-Modell XT. Grundlagen, Methodik und Anwendungen. Springer, Berlin/Heidelberg.
- Malik, M. (2006): Führen, Leisten, Leben. Wirksames Management für eine neue Zeit. Campus, Frankfurt a. M.
- Mangold, P. (2009): IT-Projektmanagement kompakt. 3.Auflage, Spektrum.
- Motzel, E./Pannenbäcker, O. (1998): Projektmanagement-Kanon. Der deutsche Zugang zum Project Management Body of Knowledge. TÜV-Verlag, Köln.
- Patzak, G./Rattay, G.: Projektmanagement. Leitfaden zum Management von Projekten, Projektportfolios und projektorientierten Unternehmen. 5. Auflage, Linde Verlag, Wien.
- Phillips, J. (2010): IT Project Management. On Track from Start to Finish. 3. Auflage, McGraw-Hill, New York, NY.
- Pichler, R. (2007): Scrum. Agiles Projektmanagement erfolgreich einsetzen. dpunkt.verlag, Heidelberg.
- Schwalbe, K. (2010): Information Technology Project Management. 6. Auflage, Course Technology, Independence, KY.
- Tiemeyer, E. (2010): Handbuch IT-Projektmanagement. Vorgehensmodelle, Managementinstrumente, Good Practices. Hanser, München.
- Versteegen, G. (2000): Projektmanagement: mit dem Rational Unified Process. Springer, Berlin/Heidelberg.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

# 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

- Hanschke, I. (2011): Enterprise Architecture Management. Einfach und effektiv. Hanser, München.
- Keller, W. (2012): IT-Unternehmensarchitektur. Von der Geschäftsstrategie zur optimalen IT-Unterstützung. 2. Auflage, dpunkt.verlag, Heidelberg.
- Keuntje, J. H./Barkow, R. (Hrsg.) (2010): Enterprise Architecture. Management in der Praxis. Wandel, Komplexität und IT-Kosten im Unternehmen beherrschen. Symposion Publishing, Ettlingen.
- Ross, J. W./ Weill, P./Robertson, D. C. (2006): Enterprise Architecture as Strategy. Creating a Foundation for Business Execution. Harvard Business Review Press, Boston, MA.
- Schwarzer, B. (2009): Einführung in das Enterprise Architecture Management. Verstehen – Planen – Umsetzen. Books on Demand, Norderstedt.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed



## Applied Sales

Module Code: DLBDSEAS

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### 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

#### Module Exam

#### Split Exam

##### Applied Sales I

- Study Format "Distance Learning": Exam

##### Applied Sales II

- Study Format "Distance Learning": Exam

### 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 IUBH

All Bachelor Programmes in the Marketing & Communication fields

## Applied Sales I

Course Code: DLBDSEAS01

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

### 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**

- Dannenberg, H./Zupancic, D. (2010): Spitzenleistungen im Vertrieb. Optimierungen im Vertriebs- und Kundenmanagement. 2. Auflage, Gabler, Wiesbaden.
- Eicher, H. (2006): Die geheimen Spielregeln im Verkauf. Wissen, wie der Kunde tickt. Campus, Frankfurt a. M.
- Herndl, K. (2014): Führen im Vertrieb. So unterstützen Sie Ihre Mitarbeiter direkt und konsequent. 4. Auflage, Gabler, Wiesbaden.
- Limbeck, M. (2016): Das neue Hardselling. Verkaufen heißt verkaufen – So kommen Sie zum Abschluss. 6. Auflage, Gabler, Wiesbaden.
- Schneider, W./Henning, A. (2008): Lexikon Kennzahlen für Marketing und Vertrieb. Das Marketing-Cockpit von A – Z. 2. Auflage, Springer, Berlin/Heidelberg.
- Winkelmann, P. (2012): Marketing und Vertrieb. Fundamente für die Marktorientierte Unternehmensführung. 8. Auflage, Oldenbourg, München.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Applied Sales II

Course Code: DLBDSEAS02

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

### 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

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

- Dannenberg, H./Zupancic, D. (2010): Spitzenleistungen im Vertrieb. Optimierungen im Vertriebs- und Kundenmanagement. 2. Auflage, Gabler, Wiesbaden.
- Eicher, H. (2006): Die geheimen Spielregeln im Verkauf. Wissen, wie der Kunde tickt. Campus, Frankfurt a. M.
- Herndl, K. (2014): Führen im Vertrieb. So unterstützen Sie Ihre Mitarbeiter direkt und konsequent. 4. Auflage, Gabler, Wiesbaden.
- Limbeck, M. (2016): Das neue Hardselling. Verkaufen heißt verkaufen – So kommen Sie zum Abschluss. 6. Auflage, Gabler, Wiesbaden.
- Schneider, W./Henning, A. (2008): Lexikon Kennzahlen für Marketing und Vertrieb. Das Marketing-Cockpit von A – Z. 2. Auflage, Springer, Berlin/Heidelberg.
- Winkelmann, P. (2012): Marketing und Vertrieb. Fundamente für die Marktorientierte Unternehmensführung. 8. Auflage, Oldenbourg, München.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBDSEAS02

# Mobile Software Engineering

Module Code: IWMB\_E

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

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

## Module Coordinator

N.N. (Mobile Software Engineering) / N.N. (Project: Mobile Software Engineering)

## Contributing Courses to Module

- Mobile Software Engineering (IWMB01\_E)
- Project: Mobile Software Engineering (IWMB02\_E)

## Module Exam Type

### Module Exam

### Split Exam

Mobile Software Engineering

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

Project: Mobile Software Engineering

- Study Format "Fernstudium": Written Assessment: Project Report (49)

## Weight of Module

see curriculum

<p><b>Module Contents</b></p> <p><b>Mobile Software Engineering</b></p> <ul style="list-style-type: none"> <li>▪ Basics of Mobile Software Development</li> <li>▪ Android System Architecture</li> <li>▪ Programming Environment</li> <li>▪ Core Components of Android Apps</li> <li>▪ Interaction between Application Components</li> <li>▪ Advanced Methods</li> </ul> <p><b>Project: Mobile Software Engineering</b></p> <p>Design, implementation and documentation of small, mobile applications based on a specific example.</p>	
<p><b>Learning Outcomes</b></p> <p><b>Mobile Software Engineering</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ recognize and describe the variances and specific features of software development for mobile systems.</li> <li>▪ distinguish between different activities, parts and risks in the creation, operation and maintenance of mobile software systems .</li> <li>▪ explain and differentiate the architecture and technical features of the Android Platform.</li> <li>▪ autonomously create mobile software systems to solve concrete problems for the Android Platform .</li> </ul> <p><b>Project: Mobile Software Engineering</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ autonomously design and prototype small mobile applications to solve a specific task.</li> <li>▪ identify typical problems and challenges in the practical implementation of small mobile applications.</li> <li>▪ document the creation and implementation of small, autonomously designed and implemented mobile applications .</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the fields of Computer Science &amp; Software</p>	<p><b>Links to other Study Programs of IUBH</b></p> <p>All Bachelor Programmes in the IT &amp; Technology fields</p>

# Mobile Software Engineering

Course Code: IWMB01\_E

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

## 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

- Eason, J. (2014): Android Studio 1.0. (URL: <https://android-developers.googleblog.com/2014/12/android-studio-10.html> [letzter Zugriff: 12.06.2015]).
- Google Inc. (Hrsg.) (2015): Android Developer Guide. (URL: <http://developer.android.com/guide>)
- Google Inc. (Hrsg.) (2015): App Components. (URL: <http://developer.android.com/guide/components/index.html> [letzter Zugriff: 12.06.2015]).
- Google Inc. (Hrsg.) (2015): Installing the Android SDK. (URL: <http://developer.android.com/sdk/installing/index.html> [letzter Zugriff: 13.05.2015]).
- Google Inc. (Hrsg.) (2015): Resources Overview. (URL: <http://developer.android.com/guide/topics/resources/overview.html> [letzter Zugriff: 12.06.2015]).
- Hipp, Wyrick & Company, Inc. (Hrsg.) (2015): SQLite Webseite. (URL: <http://sqlite.org/index.html> [letzter Zugriff: 12.06.2015]).



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Project: Mobile Software Engineering

Course Code: IWMB02\_E

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

### 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****Further Reading**

- Becker, A./Pant, M. (2015): Android 5. Programmieren für Smartphones und Tablets. 4. Auflage, dpunkt, Heidelberg.
- Eason, J. (2014): Android Studio 1.0. (URL: <http://android-developers.blogspot.de/2014/12/android-studio-10.html> [letzter Zugriff: 12.06.2015]).
- Franke, F./Ippen, J. (2012): Apps mit HTML5 und CSS3. Rheinwerk Verlag, Bonn.
- Google Inc. (Hrsg.) (2015): Android Developer Guide. (URL: <http://developer.android.com/guide>)
- Google Inc. (Hrsg.) (2015a): App Components. (URL: <http://developer.android.com/guide/components/index.html> [letzter Zugriff: 12.06.2015]).
- Google Inc. (Hrsg.) (2015b): Installing the Android SDK. (URL: <http://developer.android.com/sdk/installing/index.html> [letzter Zugriff: 13.05.2015]).
- Google Inc. (Hrsg.) (2015c): Resources Overview. (URL: <http://developer.android.com/guide/topics/resources/overview.html> [letzter Zugriff: 12.06.2015]).
- Hipp, Wyrick & Company, Inc. (Hrsg.) (2015): SQLite Webseite. (URL: <http://sqlite.org/index.html> [letzter Zugriff: 12.06.2015]).
- Künneht, T. (2016): Android 7. Das Praxisbuch für Entwickler. 4. Auflage, Rheinwerk, Bonn.

**Study Format Fernstudium**

<b>Study Format</b> Fernstudium	<b>Course Type</b> Project
------------------------------------	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Foreign Language Italian

Module Code: DLFLI

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

N.N. (Foreign Language Italian)

### Contributing Courses to Module

- Foreign Language Italian (DLFLI01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 180 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Depending on the CEFR classification, students are qualified to
  - understand and use familiar everyday expressions and very simple sentences aimed at satisfying concrete needs. They can introduce themselves and others and ask other people questions about themselves – e.g. where they live, who they know, or what things they have – and answer questions of this kind. They can communicate in a simple way if the other party speaks slowly and clearly and is willing to help. (Level A1)\*\*
  - understand sentences and frequently used expressions related to areas of most immediate relevance (e.g., personal and family information, shopping, work, and local area). They can communicate in simple, routine situations that involve a simple and direct exchange of information about familiar and common things. They can use simple language to describe their own background and education, their immediate environment, and things related to immediate needs. (Level A2)\*\*
  - understand the main points when clear standard language is used and when it comes to familiar matters from work, school, and leisure, etc. They can cope with most situations encountered when traveling in an area where the language is spoken. They can express themselves simply and coherently on familiar topics and personal areas of interest. They can report on experiences and events, describe dreams, hopes and goals, and give brief reasons or explanations for their plans and views. (Level B1) \*\*
  - understand the main contents of complex texts on concrete and abstract topics and, in their own field, also technical discussions. They can communicate so spontaneously and fluently that a normal conversation with native speakers is possible without much effort on both sides. They can express themselves clearly and in detail on a wide range of topics, explain a point of view on a topical issue, and indicate the advantages and disadvantages of different options. (Level B2) \*\*
  - understand a wide range of demanding, longer texts and grasp implicit meanings. They can express themselves spontaneously and fluently without often having to search for words. They can use the language effectively and flexibly in social and professional life or in training and studies. They can express themselves in a clear, structured, and detailed manner on complex issues, using various means of text linking appropriately. (Level C1)\*\*\*
- Grammar:
  - Level A1 – includes present and past tenses, sentence construction, and prepositions, etc.
  - Level A2 – includes historical tenses, differences in times of the past, imperative, subordinate clauses, and pronouns (dative, accusative)
  - Level B1 - among others, an introduction of the pluperfect, conjunctions, the passive, adverbs, adjectives (difference), and the future tense
  - Level B2 - includes verb constructions, conditional sentences, and indirect speech, etc.
  - Level C1 - Exercises to consolidate and repeat what has been learned
- \*\*Source:  
[http://www.coe.int/t/dg4/linguistic/Cadre1\\_en.asp](http://www.coe.int/t/dg4/linguistic/Cadre1_en.asp)  
 and  
[http://www.coe.int/t/dg4/linguistic/Source/Framework\\_EN.pdf](http://www.coe.int/t/dg4/linguistic/Source/Framework_EN.pdf)
- \*\*\* Source:  
<http://www.goethe.de/z/50/commeuro/303.htm>

<b>Learning Outcomes</b> <b>Foreign Language Italian</b> On successful completion, students will be able to	
<b>Links to other Modules within the Study Program</b> This module is similar to other modules in the field of Languages	<b>Links to other Study Programs of IUBH</b> All Distance Learning Bachelor Programmes

## Foreign Language Italian

Course Code: DLFLI01

Study Level	Language of Instruction	Contact Hours	CP	Admission Requirements
BA	English		10	none



### Course Description

The qualification goals correspond to level A1-C1 according to the criteria of the Common European Framework of Reference for Languages (CEFR).A1-A2: The basic use of Italian as a foreign language is taught and practiced on the basis of everyday topics and basic grammatical structures.B1: With an expansion of grammatical knowledge and skills and the development of vocabulary in fields such as everyday working life, culture, business, and current events, the independent use of Italian as a foreign language is taught and practiced.B2: The independent use of Italian as a foreign language is taught and practiced by broadening and deepening previous grammatical knowledge and skills and expanding vocabulary in fields such as everyday work, culture, business, professional specializations, and current events.C1: The independent use of the foreign language Italian is taught and practiced with an extension and deepening of the previous grammatical knowledge and skills and the expansion of the vocabulary in fields such as everyday working life, culture, economics, professional specializations, and current events.Course Objectives and Outcome:Course Objectives and Outcome:A1-A2: Upon successful completion of the course, students can use Italian in everyday situations at level A1-A2 CEFR.B1: Upon successful completion of the course, students can use Italian in everyday situations at B1 CEFR level. Starting at this level, students are able to develop their language skills independently through application and further self-study.B2: Upon successful completion of the course, students will be able to independently use Italian at the B2 CEFR level in most daily and professional situations. They are able to express themselves on a wide range of topics, understand specialist discussions in their own specialist field, and communicate spontaneously and fluently so that a normal conversation with native speakers is possible without great effort. Starting from this level, the students can further develop their language skills with further self-study. C1: Upon successful completion of the course, students will be able to express themselves fluently and spontaneously without often having to search for words. They can use the language effectively and flexibly in social and professional life or in training and studies. Students can express themselves in a clear, structured, and detailed way on complex subjects, using various means of text linking appropriately. Starting from this level, the students can further develop their language skills in application and with further self-study.Course Content:The students are able to:Themes: Family (description and introduction of themselves, description and introduction of friends, colleagues and acquaintances); Living (living situation, places of residence); Leisure (shopping, hobbies, traveling, forms of travel, and recreation); Telephoning, reservations, confirmation of orders, feedback; Communication: "Small talk", meetings; Description of their living situation (living, work, and leisure)Grammar: includes past and present tense, sentence construction, and prepositions, etc.Contents of the course A2:The students are able to:Themes everyday life, work, education, studies; work situation, fields of work, places of work, professional goals; personality, description of characteristics; making appointments and agreements; communication: "small talk", talks about places of work, fields of work; description of work situationGrammar: includes imperfect and perfect tenses, the subjunctive, modal verbs, and syntaxContents of the course B1:The students are able to:Thematic: environment: description of places and countries (location, people, places of interest, and special features, etc.); events in business, culture, and politics of immediate importance; use of the foreign language in everyday professional situations; writing: coherent description of places, situations, experiences, recommendations; communication: dialogues, short lecturesGrammar: Training and extension of the applicable sentence tree possibilities (including the subjunctive in various tenses, imperatives, modal verbs, and relative clauses, etc.)Contents of the course B2:The students are able to:Themes: the work day, distribution, sales, communication, human resources, career, solutions for private and business tasksGrammar: includes verb constructions, conditional sentences, and indirect speech, etc.Contents of the course C1:The students are able to:Themes: describe complex issues in detail, link topics with each other, paying special attention to certain aspects, and giving an appropriate conclusionGrammar: includes verb constructions, conditional

**Course Outcomes**

On successful completion, students will be able to

**Contents**

**Literature**

**Compulsory Reading**

**Further Reading**

- according to the online course Rosetta Stone

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b>
--	--------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 180 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 180 h	<b>Presence</b> 0 h	<b>Tutorial</b> 60 h	<b>Self Test</b> 60 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 300 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLFLI01

## Foreign Language French

Module Code: DLFLF

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

N.N (Foreign Language French)

### Contributing Courses to Module

- Foreign Language French (DLFLF01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 180 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Depending on the CEFR classification, students are qualified to
  - understand and use familiar everyday expressions and very simple sentences aimed at satisfying concrete needs. They can introduce themselves and others and ask other people questions about themselves – e.g., where they live, who they know, or what things they have – and answer questions of this kind. They can communicate in a simple way if the other party speaks slowly and clearly and is willing to help. (Level A1)\*\*
  - understand sentences and frequently used expressions related to areas of most immediate relevance (e.g., personal and family information, shopping, work, and their local area). They can communicate in simple, routine situations that involve a simple and direct exchange of information about familiar and common things. They can use simple language to describe their own background and education, their immediate environment, and things related to their immediate needs. (level A2)\*\*
  - understand the main points when clear standard language is used and when it comes to familiar matters about work, school, and leisure, etc. They can cope with most situations encountered when traveling in an area where the language is spoken. They can express themselves simply and coherently on familiar topics and personal areas of interest. They can report on experiences and events, describe dreams, hopes and goals, and give brief reasons or explanations for their plans and views. (level B1) \*\*
  - understand the main contents of complex texts on concrete and abstract topics and, in their own field, also technical discussions. They can communicate spontaneously and fluently so that a normal conversation with native speakers is possible without much effort. They can express themselves clearly and in detail on a wide range of topics, explain a point of view on a topical issue, and indicate the advantages and disadvantages of different options. (level B2) \*\*
  - understand a wide range of demanding, longer texts and also grasp implicit meanings. They can express themselves spontaneously and fluently without often having to search for words. They can use the language effectively and flexibly in social and professional life or in training and studies. They can express themselves in a clear, structured, and detailed manner on complex issues, using various means of text linking appropriately. (level C1)\*\*\*
- Grammar:
  - Level A1 – includes present and past tenses, sentence construction, and prepositions, etc.
  - Level A2 – includes historical tenses, differences in times of the past, imperative, subordinate clauses, and pronouns (dative, accusative)
  - Level B1 – Among others, an introduction of the pluperfect, conjunctions, the passive, adverbs, adjectives (difference), and the future tense
  - Level B2 – Includes verb constructions, conditional sentences, and indirect speech, etc.
  - Level C1 – Exercises to consolidate and repeat what has been learned
- \*\*Source  
[http://www.coe.int/t/dg4/linguistic/Cadre1\\_en.asp](http://www.coe.int/t/dg4/linguistic/Cadre1_en.asp)  
 and  
[http://www.coe.int/t/dg4/linguistic/Source/Framework\\_EN.pdf](http://www.coe.int/t/dg4/linguistic/Source/Framework_EN.pdf)
- \*\*\*&lt;font color="#ffff00"&gt;  
 -=<http://www.goethe.de/z/50/commeuro/303.htm>-= sync:ßÇÈâÈâ

<b>Learning Outcomes</b> <b>Foreign Language French</b> On successful completion, students will be able to	
<b>Links to other Modules within the Study Program</b> This module is similar to other modules in the field of Languages	<b>Links to other Study Programs of IUBH</b> All Distance Learning Bachelor Programmes

## Foreign Language French

Course Code: DLFLF01

Study Level	Language of Instruction	Contact Hours	CP	Admission Requirements
BA	English		10	none



### Course Description

The qualification goals correspond to levels A1 through C1, according to the criteria of the Common European Framework of Reference for Languages (CEFR).

**A1/A2:** The basics of French as a foreign language are taught and practiced using everyday topics and simple grammatical structures.

**B1:** Independent use of French as a foreign language is taught, expanding the learner's grammatical knowledge and skills and developing their vocabulary in areas such as everyday working life, culture, business, and current events.

**B2:** Independent use of French as a foreign language is taught and practiced by broadening and deepening previous grammatical knowledge and skills and expanding vocabulary in areas such as everyday work, culture, business, professional specializations, and current events.

**C1:** Independent use of French as a foreign language is taught and practiced with a focus on extending and deepening previous grammatical knowledge and skills and expanding vocabulary in areas such as everyday working life, culture, economics, professional specializations, and current events.

**Course Objectives and Outcome:**

**A1/A2:** Upon successful completion of the course, students can use French in everyday situations at level A1/A2 CEFR.

**B1:** Upon successful completion of the course, students can use French in everyday situations at level B1 CEFR. Starting at this level, students are able to develop their language skills independently through application and further self-study.

**B2:** Upon successful completion of the course, students will be able to independently use French at the level B2 CEFR in most professional situations. They are able to express themselves on a wide range of topics, understand specialist discussions in their own specialist field, and communicate spontaneously and fluently so that a normal conversation with native speakers is possible without great effort. Starting from this level, students can further develop their language skills in application and with further self-study.

**C1:** Upon successful completion of the course, students will be able to express themselves fluently and spontaneously without often having to search for words. They can use the language effectively and flexibly in social and professional life or in training and studies. Students can express themselves in a clear, structured, and detailed way on complex subjects, using various means of text linking appropriately. Starting from this level, the students can further develop their language skills in application and with further self-study.

**Course Content:**

The students are able to:

**Themes:** Family (description and introduction of themselves, description and introduction of friends, colleagues, and acquaintances); Living (living situation and places of residence); Leisure (shopping, hobbies, traveling, forms of travel, and recreation); Telephoning, reservations, confirmation of orders, and feedback; Communication: "Small talk", meetings; Description of life situation (living, work, and leisure)

**Grammar:** Includes present and past tense, sentence construction, and prepositions, etc.

**Contents of the course A2:**

The students are able to:

**Themes:** everyday life, work, education, studies; work situation, fields of work, places of work, professional goals; personality, description of characteristics; making appointments and agreements; communication: "small talk", talks about places of work, fields of work; description of their work.

**Grammar:** among other things, the imperfect and subjunctive tenses, modal verbs, and sentence construction

**Contents of the course B1:**

The students are able to:

**Themes:** environment: description of places and countries (location, people, places of interest, and special features, etc.); events in business, culture, and politics of immediate importance; use of the foreign language in everyday professional situations; writing: coherent description of places, situations, experiences, recommendations; communication: dialogues and short lectures

**Grammar:** Training and extension of the applicable sentence tree possibilities (including the subjunctive in various tenses, the imperative, modal verbs, and relative clauses, etc.)

**Contents of the course B2:**

The students are able to:

**Themes:** working day, distribution, sales, communication, human resources, career, solutions for private and business tasks

**Grammar:** includes verb constructions, conditional sentences, and indirect speech, etc.

**Contents of the course C1:**

The students are able to:

**Themes:** describe complex issues in detail, link topics with each other, paying special attention to certain aspects and giving an appropriate conclusion.

**Grammar:** includes verb constructions, conditional sentences, and

**Course Outcomes**

On successful completion, students will be able to

**Contents**

**Literature**

**Compulsory Reading**

**Further Reading**

- according to the online course Rosetta Stone

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b>
--	--------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 180 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 180 h	<b>Presence</b> 0 h	<b>Tutorial</b> 60 h	<b>Self Test</b> 60 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 300 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLFLF01

## German Language

Module Code: DLSPGLA

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

N.N. (Foreign Language: German)

### Contributing Courses to Module

- Foreign Language: German (DLSPGLA01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 180 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

Based on general and the use of basic and advanced grammar structures, the students will learn and practice German as a Foreign Language following a CEFRL assessment test.

**Learning Outcomes****Foreign Language: German**

On successful completion, students will be able to

- use German as a Foreign Language on the corresponding CEFR level. The qualifications aimed at correspond to the A1, A2, B1, B2 and C1 levels in accordance with the criteria of the Common European Framework of Reference for Languages (CEFR).

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

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

**Links to other Study Programs of IUBH**

All Distance Learning Bachelor Programmes

## Foreign Language: German

Course Code: DLSPGLA01

Study Level	Language of Instruction	Contact Hours	CP	Admission Requirements
BA	English		10	none

### Course Description

Depending on the chosen CEFR level, the students will be enabled to: \*\*A1 understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Interact in a simple way provided the other person talks slowly and clearly and is prepared to help. A2 understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need. B1 understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Deal with most situations likely to arise whilst travelling in an area where the language is spoken. Produce simple connected text on topics, which are familiar, or of personal interest. Describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans. B2 understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialization. Interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options. C1 understand a wide range of sophisticated, longer texts and to grasp implicit meanings. They can express themselves spontaneously and fluently, without having to search for words more clearly. They can use the language effectively and flexibly in their social and professional life or in education and study. They can speak clearly, in a structured manner and in detail about complex issues, using various means of linking text appropriately.\*\*source: [http://www.coe.int/t/dg4/linguistic/Source/Framework\\_EN.pdf](http://www.coe.int/t/dg4/linguistic/Source/Framework_EN.pdf) and <http://www.goethe.de/z/50/commeuro/303.htm>

### Course Outcomes

On successful completion, students will be able to

- use German as a Foreign Language on the corresponding CEFR level. The qualifications aimed at correspond to the A1, A2, B1, B2 and C1 levels in accordance with the criteria of the Common European Framework of Reference for Languages (CEFR).

### Contents

**Literature**

**Compulsory Reading**

**Further Reading**

- Hagner, V./ Schlüter, S. (2013): Im Beruf. Deutsch als Fremd- und Zweitsprache. Hueber Verlag, München.
- Perlmann-Balme, M./ Schwalb, S./ Matussek, Magdalena (2013): Sicher! B2/1. Deutsch als Fremdsprache. Hueber Verlag, München.
- Eismann, Volker (2006): Training berufliche Kommunikation. B2-C1 - Erfolgreich bei Präsentationen. Kursbuch mit CD Taschenbuch. Cornelsen Verlag, Berlin.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b>
--	--------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 180 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 180 h	<b>Presence</b> 0 h	<b>Tutorial</b> 60 h	<b>Self Test</b> 60 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 300 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLSPGLA01

## Foreign Language Spanish

Module Code: DLFLS

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

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

### Module Coordinator

N.N. (Foreign Language Spanish)

### Contributing Courses to Module

- Foreign Language Spanish (DLFLS01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 180 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- Depending on the CEFR classification, students will be able to
  - understand and use familiar everyday expressions and very simple sentences aimed at satisfying concrete needs. They can introduce themselves and others and ask other people questions about themselves - e.g., where they live, who they know, or what things they have - and provide answers to these kinds of questions. They can communicate in a simple way if the other party speaks slowly and clearly and is willing to help (Level A1).\*\*
  - understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. personal and family information, shopping, work, and their local area). They can communicate in simple, routine situations that involve a simple and direct exchange of information about familiar and common things. They can use simple language to describe their own background and education, their immediate environment, and things related to their immediate needs (Level A2)\*\*
  - understand the main points when clear standard language is used and when it comes to familiar matters about work, school, leisure, etc. They can cope with most situations encountered when travelling in an area where the language is spoken. They can express themselves simply and coherently on familiar topics and personal areas of interest. They can report on experiences and events, describe dreams, hopes and goals, and give brief reasons or explanations for their plans and views. (Level B1) \*\*
  - understand the main content of complex texts on concrete and abstract topics and, in their own field, also technical discussions. They can communicate spontaneously and fluently so that a normal conversation with native speakers is possible without much mutual effort. They can express themselves clearly and in detail on a wide range of topics, explain a point of view on a topical issue, and indicate the advantages and disadvantages of different options. (Level B2) \*\*
  - understand a wide range of demanding, longer texts and also grasp implicit meanings. They can express themselves spontaneously and fluently without having to search for words. They can use the language effectively and flexibly in social and professional life or in training and studies. They can express themselves in a clear, structured, and detailed manner on complex issues, using various means of text linking appropriately. (level C1)\*\*\*
- Grammar:
  - Level A1 - Includes present and past tenses, sentence construction, and prepositions, etc.
  - Level A2 - Includes historical tenses, differences in times of the past, imperative, subordinate clauses, and pronouns (dative, accusative)
  - Level B1 - Among others, introduces the pluperfect, conjunctions, the passive, adverbs, adjectives (difference), and the future tense
  - Level B2 - Includes verb constructions, conditional sentences, and indirect speech, etc.
  - Level C1 – Includes exercises to consolidate and repeat what has been learned
- \*\*Source  
[http://www.coe.int/t/dg4/linguistic/Cadre1\\_en.asp](http://www.coe.int/t/dg4/linguistic/Cadre1_en.asp)  
 and  
[http://www.coe.int/t/dg4/linguistic/Source/Framework\\_EN.pdf](http://www.coe.int/t/dg4/linguistic/Source/Framework_EN.pdf)
- \*\*\*Source  
<http://www.goethe.de/z/50/commeuro/303.htm>

<b>Learning Outcomes</b> <b>Foreign Language Spanish</b> On successful completion, students will be able to	
<b>Links to other Modules within the Study Program</b> This module is similar to other modules in the field of Languages	<b>Links to other Study Programs of IUBH</b> All Distance Learning Bachelor Programmes

## Foreign Language Spanish

Course Code: DLFLS01

Study Level	Language of Instruction	Contact Hours	CP	Admission Requirements
BA	English		10	none

### Course Description

Study goals correspond to the language levels A1-C1, as specified in the Common European Framework of Reference for Languages (CEFR).A1-A2: The basic use of Spanish as a foreign language is taught and practiced on the basis of everyday topics and basic grammatical structures.B1: With an expansion of grammatical knowledge and skills and the development of vocabulary in fields such as everyday working life, culture, business and current events, the independent use of Spanish is taught and practiced.B2: The independent use of Spanish is taught and practiced with an extension and deepening of the previous grammatical knowledge and skills and the expansion of the vocabulary in fields such as everyday working life, culture, economics, professional specializations, and current events.C1: The independent use of Spanish is taught and practiced with an extension and deepening of the previous grammatical knowledge and skills and the expansion of the vocabulary in fields such as everyday working life, culture, economics, professional specializations, and current events.Course Objectives and Outcome:Course Objectives and Outcome:A1-A2: Upon successful completion of the course, students can use Spanish in everyday situations at level A1-A2 CEFR.B1: Upon successful completion of the course, students can use Spanish in everyday situations at B1 CEFR level. Starting at this level, students are able to develop their language skills independently through application and further self-study.B2: Upon successful completion of the course, students will be able to independently use Spanish at the B2 CEFR level in most daily and professional situations. They are able to express themselves on a wide range of topics in order to understand specialist discussions in their own specialist field, and to communicate spontaneously and fluently so that a normal conversation with native speakers is possible without great effort being made by either side. Starting from this level, students can further develop their language with further self-study.C1: Upon successful completion of the course, students will be able to express themselves fluently and spontaneously without having to search for words often. They can use the language effectively and flexibly in social and professional life or in training and studies. Students can express themselves in a clear, structured and detailed way on complex subjects, using various means of text linking appropriately. Starting from this level, the students can further develop their language skills with further self-study.Course Content:The students are able to:Themes: Family (description and introduction of themselves, description and introduction of friends, colleagues, and acquaintances); Living (living situation, places of residence); Leisure (shopping, hobbies, travelling, forms of travel, and recreation); Telephoning, reservation, confirmation of order, feedback; Communication: "Small talk", meetings; Description of daily life (living, work, and leisure)Grammar: includes present and past tense, sentence construction, and prepositions, etc.Contents of the course A2:The students are able to:Themes: everyday life, work, education, and studies; work situation, fields of work, places of work, professional goals; personality and description of characteristics; making appointments and agreements; communication: "small talk", talking about places of work, fields of work, describing their work situation.Grammar: includes the perfect and imperfect tenses, the subjunctive, modal verbs, and sentence structureContents of the course B1:The students are able to:Themes: environment: description of places and countries (location, people, places of interest, and special features, etc.); events in business, culture, and politics of immediate importance; use of the foreign language in everyday professional situations; writing: coherent description of places, situations, experiences, recommendations; communication: dialogues and short lectures.Grammar: Training and extension of the applicable sentence tree possibilities (including subjunctive in various tenses, imperative, modal verbs, and relative clauses, etc.)Contents of the course B2:The students are able to:Themes: working day, distribution, sales, communication, human resources, career, solutions for private and business tasksGrammar: includes verb constructions, conditional sentences, and indirect speech, etc.Contents of the course C1:The students are able to:Thematically: describe complex issues in detail, link topics with each other, paying special attention to certain aspects and giving an appropriate conclusionGrammar: including verb

**Course Outcomes**

On successful completion, students will be able to

**Contents**

**Literature**

**Compulsory Reading**

**Further Reading**

- according to the online course Rosetta Stone



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b>
--	--------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 180 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 180 h	<b>Presence</b> 0 h	<b>Tutorial</b> 60 h	<b>Self Test</b> 60 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 300 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

DLFLS01

## Foreign Language Turkish

Module Code: DLFLT

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

N.N. (Foreign Language Turkish)

### Contributing Courses to Module

- Foreign Language Turkish (DLFLT01)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 180 Minutes

#### Split Exam

### Weight of Module

see curriculum

**Module Contents**

- Depending on the acquired CEFR level, students are enabled to
- understand and use familiar, everyday expressions and very simple sentences aimed at the fulfilment of fundamental needs. Students can introduce themselves and others, ask and answer questions about themselves and others, such as where they live, people they know and things they own. They can communicate in a simple way if the person they are talking to speaks slowly and clearly and is willing to help. (Level A1) \*\*
- understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. personal and family information, shopping, work, accustomed settings). Students can communicate in simple, familiar situations involving a basic and direct exchange of information on habitual and predictable issues. They can describe their own background and education, their immediate environment and things related to immediate needs in simple expressions. (Level A2)
- Grammar:
- Level A1 - among other things tenses of the present and past, sentence structure
- Level A2 – among other things tenses of the past, differences in past tenses, imperative, subordinate clauses, pronouns
- \*\*Source  
[http://www.coe.int/t/dg4/linguistic/Cadre1\\_en.asp](http://www.coe.int/t/dg4/linguistic/Cadre1_en.asp)  
 and  
[http://www.coe.int/t/dg4/linguistic/Source/Framework\\_EN.pdf](http://www.coe.int/t/dg4/linguistic/Source/Framework_EN.pdf)
- \*\*\* Source:  
<http://www.goethe.de/z/50/commeuro/303.htm>

**Learning Outcomes**

**Foreign Language Turkish**

On successful completion, students will be able to

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

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

**Links to other Study Programs of IUBH**

All Distance Learning Bachelor Programmes

## Foreign Language Turkish

Course Code: DLFLT01

Study Level	Language of Instruction	Contact Hours	CP	Admission Requirements
BA	English		10	none

### Course Description

Description of the course: The qualification objectives correspond to levels A1-A2 following the criteria of the Common European Framework of Reference for Languages (CEFR). A1-A2: The elementary use of the foreign language Turkish is taught and practiced on the basis of everyday topics and using elementary grammatical structures. Course objectives: A1-A2: After successful completion of the course, students can use Turkish in everyday situations at the A1 CEFR level. Contents of the course A1: Students are enabled to, Thematic: family (description and introduction of oneself, description and introduction of friends, colleagues and acquaintances); residence (living situation, places of residence); leisure time (shopping, hobbies, travelling, forms of travel, recreation); telephoning, reservations, order confirmation, feedback; communication: "small talk", getting to know each other; description of life situation (living, work, leisure time) Grammar: among other things tenses of the present and past, sentence structure Contents of the course A2: Students are enabled to, Thematic: everyday life, work, training, studies; work situation, fields of work, places of work, professional goals; personality, description of character traits; making appointments and agreements; communication: "small talk", conversations about places of work, fields of work; description of the working environment Grammar: among other things, tenses of the past, sentence structure

### Course Outcomes

On successful completion, students will be able to

### Contents

### Literature

### Compulsory Reading

### Further Reading

- according to information in the online course Rosetta Stone

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 180 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 180 h	<b>Presence</b> 0 h	<b>Tutorial</b> 60 h	<b>Self Test</b> 60 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 300 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed







# 6. Semester

---



## Smart Devices

Module Code: DLBINGSD\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### 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

#### Module Exam

#### Split Exam

##### Smart Devices I

- Study Format "Fernstudium": Exam, 90 Minutes

##### Smart Devices II

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

### 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 IUBH**

All Bachelor Programs in the IT & Technology fields

# Smart Devices I

Course Code: DLBINGSD01\_E

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

## 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

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

- Fortino, G./Trunfio, P. (2014): Internet of Things Based on Smart Objects. Technology, Middleware and Applications. Springer International Publishing, Cham.
- López, Tomás Sánchez et al. (2011): Taxonomy, Technology and Applications of Smart Bbjects. In: Information Systems Frontiers, No. 13, Issue 2, p. 281–300.
- McTear, M./Callejas, Z./Griol, D. (2016): The Conversational Interface. Talking to Smart Devices. Springer International Publishing, Cham.
- Nihtianov, S./Luque, A. (2014): Smart Sensors and MEMS. Intelligent Devices and Microsystems for Industrial Applications. Woodhead, Burlington.
- Poslad, S. (2009): Ubiquitous Computing. Smart Devices, Environments and Interactions. 2nd edition, Wiley, Hoboken, NJ.
- Sendler, U. (Ed.) (2018): The Internet of Things – Industrie 4.0 Unleashed. Springer, Berlin.
- Vinoy, K. J. et al. (Ed.) (2014): Micro and Smart Devices and Systems. Springer India, New Delhi.

**Study Format Fernstudium**

<b>Study Format</b> Fernstudium	<b>Course Type</b> Online Lecture
------------------------------------	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed



## Smart Devices II

Course Code: DLBINGS02\_E

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

### 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

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Factory

Module Code: DLBDESEF

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

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

### Module Coordinator

N.N. (Smart Factory I) / Prof. Dr. Christian Magnus (Smart Factory II)

### Contributing Courses to Module

- Smart Factory I (DLBDESEF01)
- Smart Factory II (DLBDESEF02)

### Module Exam Type

#### Module Exam

#### Split Exam

##### Smart Factory I

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

##### Smart Factory II

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

### 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.

**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 IUBH**

All Bachelor Programmes in the IT & Technology fields

# Smart Factory I

Course Code: DLBDESEF01

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

## 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

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

- Bangemann, T. et al. (2016): Integration of Classical Components into Industrial Cyber-Physical Systems. In: Proceedings of the IEEE, 104. Jg., Heft 5, S. 947–959. DOI: 10.1109/JPROC.2015.2510981.
- Bauernhansl, T./Hompel, M. ten/Vogel-Heuser, B. (Hrsg.) (2014): Industrie 4.0 in Produktion, Automatisierung und Logistik. Springer, Berlin.
- Bundesministerium für Wirtschaft und Energie (Hrsg.) (2016): IT-Sicherheit für die Industrie 4.0. Produktion, Produkte, Dienste von morgen im Zeichen globalisierter Wertschöpfungsketten. Berlin.
- Geisberger, E./Broy, M. (Hrsg.) (2012): agendaCPS. Integrierte Forschungsagenda Cyber-Physical Systems. Springer, Berlin/Heidelberg.
- Harrison, R./Vera, D.; Ahmad, B. (2016): Engineering Methods and Tools for Cyber-Physical Automation Systems. In: Proceedings of the IEEE, 104. Jg., Heft 5, S. 973–985. DOI: 10.1109/JPROC.2015.2510665.
- Hauptert, J. (2013): DOMEMan: Repräsentation, Verwaltung und Nutzung von digitalen Objektgedächtnissen. Akademische Verlagsgesellschaft AKA, Berlin.
- VDMA & Partner (2016): Leitfaden Industrie 4.0 Security. Handlungsempfehlungen für den Mittelstand. VDMA Verlag, Frankfurt a. M.



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

## Smart Factory II

Course Code: DLBDESEF02

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

### 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**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBDESF02

## Smart Mobility

Module Code: DLBINGSM\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### 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

#### Module Exam

#### Split Exam

##### Smart Mobility I

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

##### Smart Mobility II

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

### 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 IUBH**

All Bachelor Programs in the IT & Technology fields

# Smart Mobility I

Course Code: DLBINGSM01\_E

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

## 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****Further Reading**

- Fluegge, B. (2017): Smart Mobility – Connecting Everyone: Trends, Concepts and Best Practices Paperback. Springer/Vierweg, Wiesbaden.
- Handke, V./Jonuschat, H. (2013): Flexible Ridesharing. New Opportunities and Service Concepts for Sustainable Mobility. Springer, Berlin/Heidelberg.
- Inderwildi, O./King, D. (Eds.) (2012): Energy, Transport, & the Environment. Addressing the Sustainable Mobility Paradigm. Springer, London.
- Nathanail, E./Karakikes, I. (2018): Data Analytics: Paving the Way to Sustainable Urban Mobility: Proceedings of 4th Conference on Sustainable Urban Mobility (CSUM2018). Springer, London.
- Papa, R./Fistola, R./Gargiulo, C. (2018): Smart Planning: Sustainability and Mobility in the Age of Change (Green Energy and Technology). Springer, London.
- Planing, P. et al (2020): Innovations for Metropolitan Areas: Intelligent Solutions for Mobility, Logistics and Infrastructure designed for Citizens. Springer, London.
- Sashinskaya, M. (2015): Smart Cities in Europe. Open Data in a Smart Mobility Context. Createspace Independent Publishing Platform.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Mobility II

Course Code: DLBINGSM02\_E

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

### 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**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Services

Module Code: DLBINGSS\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 10	<b>Student Workload</b> 300 h
--------------------------------------	---------------------------------------	--------------------------	-----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### 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

<p><b>Module Contents</b></p> <p><b>Smart Services I</b></p> <ul style="list-style-type: none"> <li>▪ Digitization and disruption</li> <li>▪ Potential of Smart Services</li> <li>▪ Development and specification of Smart Services</li> <li>▪ Service architectures</li> <li>▪ Integration platforms</li> <li>▪ Technologies for Smart Services</li> <li>▪ Quality and operation of Smart Services</li> </ul> <p><b>Smart Services II</b></p> <p>Analysis of a selected topic of Smart Services and design of a self-chosen assignment in a prototyping environment.</p>	
<p><b>Learning Outcomes</b></p> <p><b>Smart Services I</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ recognize the relevance of Smart Services in the context of digitization in general and Industry 4.0 in particular.</li> <li>▪ identify special features of digital business models and demonstrate them using the example of digital intermediaries.</li> <li>▪ apply methods to uncover digitization potentials and use the Business Model Canvas to classify them in a business model.</li> <li>▪ know and use models for the multi-perspective specification of services.</li> <li>▪ know selected architectures for the design and integration of services.</li> <li>▪ distinguish different technologies that are required for the development of services.</li> <li>▪ define the quality of services by means of Service Level Agreements.</li> </ul> <p><b>Smart Services II</b></p> <p>On successful completion, students will be able to</p> <ul style="list-style-type: none"> <li>▪ have an in-depth understanding of the technologies and standards in the context of Smart Services.</li> <li>▪ apply technologies in the context of smart services using a simple practical example.</li> <li>▪ design a hardware or software prototype for a selected technical task.</li> <li>▪ document design and development activities in the form of a project report.</li> </ul>	
<p><b>Links to other Modules within the Study Program</b></p> <p>This module is similar to other modules in the fields of Computer Science &amp; Software Development</p>	<p><b>Links to other Study Programs of IUBH</b></p> <p>All Bachelor Programs in the IT &amp; Technology fields</p>

# Smart Services I

Course Code: DLBINGSS01\_E

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

## 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

## Literature

### Compulsory Reading

### Further Reading

- Chignell, M. et al. (Hrsg.) (2010): The Smart Internet. Current Research and Future Applications. Springer, Berlin.
- Evans, E. (2003): Domain-Driven Design. Tackling Complexity in the Heart of Software. Addison-Wesley, Upper Saddle River, NJ.
- Hohpe, G./Woolf, B./Brown, K. (2012): Enterprise Integration Patterns. Designing, Building, and Deploying Messaging Solutions. 16th edition, Addison-Wesley, Boston, MA.
- Nielsen, L. (2013): Personas – User Focused Design. Springer, London.
- Osterwalder, A/Pigneur, Y. (2010): Business Model Generation: A Handbook for Visionaries, Game Changers, John Wiley & Sons Inc., Hoboken, NJ.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b>	<b>Presence</b>	<b>Tutorial</b>	<b>Self Test</b>	<b>Practical Experience</b>	<b>Hours Total</b>
90 h	0 h	30 h	30 h	0 h	150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Smart Services II

Course Code: DLBINGSS02\_E

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

### Compulsory Reading

### Further Reading

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Project
--	-------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Project Report

<b>Student Workload</b>					
<b>Self Study</b> 120 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

## Digital Business Models

Module Code: DLBLODB\_E

<b>Module Type</b> see curriculum	<b>Admission Requirements</b> none	<b>Study Level</b> BA	<b>CP</b> 5	<b>Student Workload</b> 150 h
--------------------------------------	---------------------------------------	--------------------------	----------------	----------------------------------

<b>Semester / Term</b> see curriculum	<b>Duration</b> Minimum 1 semester	<b>Regularly offered in</b> WiSe/SoSe	<b>Language of Instruction</b> English
--	--	--	---

### Module Coordinator

Prof. Dr. Mario Boßlau (Digital Business Models)

### Contributing Courses to Module

- Digital Business Models (DLBLODB01\_E)

### Module Exam Type

#### Module Exam

Study Format: Distance Learning  
Exam, 90 Minutes

#### Split Exam

### Weight of Module

see curriculum

### Module Contents

- 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

**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.

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

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

**Links to other Study Programs of IUBH**

All Bachelor Programmes in the Business & Management fields

# Digital Business Models

Course Code: DLBLODB01\_E

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

## 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

- Brynjolfsson, E./Hu, Yu J./Smith, M. D. (2006): From Niches to Riches. Anatomy of the Long Tail. In: MIT Sloan Management Review, 47. Jg., Heft 4, S. 67–71.
- Gassmann, O./Frankenberger, K./Csik, M. (2013): Geschäftsmodelle entwickeln. 55 innovative Konzepte mit dem St. Galler Business Model Navigator. Hanser, München.
- Hoffmeister, C. (2015): Digital Business Modelling. Digitale Geschäftsmodelle entwickeln und strategisch verankern. Hanser, München.
- Osterwalder, A./Pigneur, Y. (2010): Business Modell Generation. Wiley, Hoboken (NJ).



**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Online Lecture
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Exam, 90 Minutes

<b>Student Workload</b>					
<b>Self Study</b> 90 h	<b>Presence</b> 0 h	<b>Tutorial</b> 30 h	<b>Self Test</b> 30 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input checked="" type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBLODB01\_E

# Principles of Management

Module Code: DLBBAPM\_E

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

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

## Module Coordinator

Prof. Dr. Markus Prandini (Principles of Management)

## Contributing Courses to Module

- Principles of Management (DLBBAPM01\_E)

## Module Exam Type

### Module Exam

Study Format: Distance Learning  
Written Assessment: Case Study

### Split Exam

## Weight of Module

see curriculum

## Module Contents

- Management Functions
- Managerial Decision-Making
- Planning and Goal-Setting
- Strategic Planning
- Organizing
- Leading
- Controlling

**Learning Outcomes****Principles of Management**

On successful completion, students will be able to

- understand the functions, roles and influencing-factors of management.
- explain the decision-making process.
- discuss basic corporate und competitive strategies.
- analyze organizational structures and designs.
- transfer knowledge about basic principles of management to real-world cases.

**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 IUBH**

All Bachelor Programmes in the Business & Management fields

# Principles of Management

Course Code: DLBBAPM01\_E

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

## Course Description

In the fast-changing and complex environment of today's business world the economic survival and success of an organization depends highly on its management. For future managers it is indispensable to be familiar with the fundamental principles of management as the basis for the development of further managerial knowledge and skills. This course introduces necessary functions, roles and skills for managers and their decision-making process. Furthermore, it discusses the basic managerial functions of planning, organizing, leading and controlling in detail.

## Course Outcomes

On successful completion, students will be able to

- understand the functions, roles and influencing-factors of management.
- explain the decision-making process.
- discuss basic corporate und competitive strategies.
- analyze organizational structures and designs.
- transfer knowledge about basic principles of management to real-world cases.

## Contents

1. Introduction to Management
  - 1.1 Functions, Roles and Skills of Managers
  - 1.2 Influencing Factors on Managers' Tasks
  - 1.3 History of Management
2. Managerial Decision-Making
  - 2.1 Decision-Making Process
  - 2.2 Approaches to Decision Making
  - 2.3 Types of Decisions and Decision-Making Conditions
3. Planning and Goal-Setting
  - 3.1 The Role of Planning
  - 3.2 Goals and Plans
  - 3.3 Setting Goals and Developing Plans

4. Strategic Planning
  - 4.1 Strategic Management
  - 4.2 The Strategic Management Process
  - 4.3 Corporate Strategies
  - 4.4 Competitive Strategies
5. Organizing
  - 5.1 Organizational Structures and Design
  - 5.2 Organizational Change
  - 5.3 Managing Change
6. Leading
  - 6.1 Interpersonal and Organizational Communication
  - 6.2 Organizational Behavior
  - 6.3 Leadership
7. Controlling
  - 7.1 The Control Process
  - 7.2 Tools for Measuring Organizational Performance

## Literature

### Compulsory Reading

### Further Reading

- Becerra, M. (2009): Theory of the Firm for Strategic Management. Cambridge University Press, Cambridge.
- Bright D.S. et al (2020): Principles of Management. (URL: <http://cnx.org/content/col28330/1.8> [Retrieved: 19 March 2020]).
- Carpenter, M./Sanders, G. (2014): Strategic Management. Concepts and Cases, New International Edition. 2nd Edition, Pearson, Harlow.
- Hitt, M.A./Freeman, R.E./Harrison, J.S. (Eds.) (2020): The Blackwell Handbook of Strategic Management. Blackwell, Oxford.
- Robbins, S.P./Coulter, M. (2020): Management, Global Edition. 15th Edition, Pearson, Hoboken, NJ.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Case Study
--	----------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> yes <b>Course Evaluation:</b> no
<b>Type of Exam</b>	Written Assessment: Case Study

<b>Student Workload</b>					
<b>Self Study</b> 110 h	<b>Presence</b> 0 h	<b>Tutorial</b> 20 h	<b>Self Test</b> 20 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 150 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input checked="" type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input checked="" type="checkbox"/> Shortcast <input checked="" type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input checked="" type="checkbox"/> Guideline <input checked="" type="checkbox"/> Live Tutorium/Course Feed

DLBBAPM01\_E



## Bachelor Thesis

Module Code: DLBBT

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

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

### 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

#### Module Exam

#### Split Exam

##### Bachelor Thesis

- Study Format "Distance Learning": Written Assessment: Bachelor Thesis

##### Colloquium

- Study Format "Distance Learning": Presentation: Colloquium

### 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 IUBH**

All bachelor programs in distance learning

# 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.

**Literature**

**Compulsory Reading**

**Further Reading**

- Hunziker, A.W. (2010): Spaß am wissenschaftlichen Arbeiten. So schreiben Sie eine gute Semester-, Bachelor- oder Masterarbeit. 4. Auflage, Verlag SKV, Zürich.
- Wehrlin, U. (2010): Wissenschaftliches Arbeiten und Schreiben. Leitfaden zur Erstellung von Bachelorarbeit, Masterarbeit und Dissertation – von der Recherche bis zur Buchveröffentlichung. AVM, München.
- Selection of literature according to topic

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Thesis
--	------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> yes
<b>Type of Exam</b>	Written Assessment: Bachelor Thesis

<b>Student Workload</b>					
<b>Self Study</b> 270 h	<b>Presence</b> 0 h	<b>Tutorial</b> 0 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 270 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input checked="" type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed

# Colloquium

Course Code: DLBBT02

Study Level	Language of Instruction	Contact Hours	CP	Admission Requirements
BA	English		1	none

## 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

- Renz, K.-C. (2016): Das 1 x 1 der Präsentation. Für Schule, Studium und Beruf. 2. Auflage, Springer Gabler, Wiesbaden.

**Study Format Distance Learning**

<b>Study Format</b> Distance Learning	<b>Course Type</b> Thesis Defense
--	--------------------------------------

<b>Information about the examination</b>	
<b>Examination Admission Requirements</b>	<b>BOLK:</b> no <b>Course Evaluation:</b> yes
<b>Type of Exam</b>	Presentation: Colloquium

<b>Student Workload</b>					
<b>Self Study</b> 30 h	<b>Presence</b> 0 h	<b>Tutorial</b> 0 h	<b>Self Test</b> 0 h	<b>Practical Experience</b> 0 h	<b>Hours Total</b> 30 h

<b>Instructional Methods</b>	
<input type="checkbox"/> Learning Sprints® <input type="checkbox"/> Course Book <input type="checkbox"/> Vodcast <input type="checkbox"/> Shortcast <input type="checkbox"/> Audio <input type="checkbox"/> Exam Template	<input type="checkbox"/> Review Book <input type="checkbox"/> Creative Lab <input type="checkbox"/> Guideline <input type="checkbox"/> Live Tutorium/Course Feed