Course Handbook Production Informatics Bachelor

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Qualifikation Goals of Study Programme

Production Informatics Bachelor - mandatory courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Bachelor Colloquium	PRI-BK	S223-0001	6	-	3	Studienleitung
Bachelor Thesis	PRI-BT	T223-0001	6	-	12	Studienleitung
Computer Architecture	PRI-RAR	P221-0037	2	2V+2P	5	Prof. Dr. Steffen Knapp
Computer Networks	PRI-RN	P222-0037	3	2V+2P	5	Prof. Dr. Steffen Knapp
Databases	PRI-DB	P222-0009	3	3V+1P	5	Prof. Dr. Klaus Berberich
Informatics 1	PRI-INF1	P222-0016	1	2V+2U	5	Prof. Dr. Damian Weber
Informatics 2	PRI-INF2	P222-0017	2	2V+2U	5	Prof. Dr. Damian Weber
Manufacturing Process Technology (with Lab Course)	PRI-TFL	P241-0286, P241-0287	2	3V+2U	5	Prof. Dr. Jürgen Griebsch
Mathematics 1	PRI-MAT1	P221-0001	1	4V+2U	7	Prof. Dr. Peter Birkner
Mathematics 2	PRI-MAT2	P221-0002	2	3V+1U	5	

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
						Prof. Dr. Peter Birkner
Mathematics 3	PRI-MAT3	P222-0002	3	2V+1U	3	Prof. Dr. Peter Birkner
Operating Systems	PRI-BS	P222-0007	3	2V+2P	5	Prof. Dr. Steffen Knapp
Production and Quality Management	PRI-PUQ	P223-0010	5	2V+1P	3	Prof. Dr. Jürgen Griebsch
Project Management	PRI-PM	P222-0032	4	2V	3	Prof. Dr. Steffen Knapp
Scientific Work	PRI-WA		4	1V+1U	2	Prof. Dr. Peter Birkner
Security Engineering	PRI-SE	P222-0039	4	2V+2P	5	Prof. Dr. Damian Weber
Technical Mechanics in Production Environments	PRI-TM	P223-0002	3	2V+2U	5	Prof. Dr.-Ing. John Heppe
Technical Reading and Writing	PRI-TRW	P222-0043	1	2S	2	Dipl.-Übers. Betina Lang
Work Experience Phase	PRI-PRA	S223-0002	6	-	15	Studienleitung

(19 modules)

Production Informatics Bachelor - optional courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
.NET Concepts and Tools	PRI-NETW		4	2V+2P	5	Thomas Beckert, M.Sc.
Cloud Computing	PRI-CCOM		4	2V+2PA	5	Prof. Dr. Markus Esch
IT Forensics	PRI-ITF		5	1V+1P	2	Prof. Dr. Damian Weber
Kinematic Principles of Robotics	PRI-KGR		5	3V+1U	5	Prof. Dr. Michael Kleer
Machine Learning	PRI-MLRN		6	2V+2U	5	Prof. Dr. Klaus Berberich
Mentoring	PRI-MENT	P200-0018	5	2S	2	Sandra Wiegand, M.A.
Programming 4	PRI-PRG4		4	3V+1P	5	Prof. Dr.-Ing. Martin Burger
User Experience Engineering	PRI-UXE		4	2V+2U	5	Prof. Dr. Maximilian Altmeyer

(8 modules)

Production Informatics Bachelor - mandatory courses

Bachelor Colloquium

Module name (EN): Bachelor Colloquium
Degree programme: Production Informatics, Bachelor, SO 01.10.2026
Module code: PRI-BK
Hours per semester week / Teaching method: -
ECTS credits: 3

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Oral presentation

[*updated 26.02.2018*]

Applicability / Curricular relevance:

DFIW-BK (S610-0212) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2019 , semester 6, mandatory course
KIB-BAK (S222-0006) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 6, mandatory course
KIB-BAK (S222-0006) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 6, mandatory course
PIB-BK (S221-0010) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 6, mandatory course
PIB-BK (S221-0010) Applied Informatics, Bachelor, SO 01.10.2026 , semester 6, mandatory course
PRI-BK (S223-0001) Production Informatics, Bachelor, SO 01.10.2023 , semester 6, mandatory course
PRI-BK (S223-0001) Production Informatics, Bachelor, SO 01.10.2026 , semester 6, mandatory course

Workload:
The total student study time for this course is 90 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Studienleitung

Lecturer: Studienleitung

[*updated 07.08.2019*]

Learning outcomes:
Students
_ will be able to analyze comprehensive material independently.
_ will be able to summarize complex interrelationships and present them in a professional manner.
_ will also be able to answer more detailed questions on the subject areas of their Bachelor thesis competently.

[*updated 26.02.2018*]

Module content:
The goal of the Bachelor colloquium is to present and explain the results and content of the Bachelor thesis orally and to verify that the work was done independently.

[*updated 26.02.2018*]

Recommended or required reading:
Literature listed in the respective Bachelor thesis.

[*updated 26.02.2018*]

Bachelor Thesis

Module name (EN): Bachelor Thesis

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-BT

Hours per semester week / Teaching method:
-

ECTS credits:
12

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Written composition

[*updated 26.02.2018*]

Applicability / Curricular relevance:

DFIW-BT (T610-0211) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2019 , semester 6, mandatory course
KIB-BAT (T222-0005) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 6, mandatory course
KIB-BAT (T222-0005) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 6, mandatory course
PIB-BT (T221-0008) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 6, mandatory course
PIB-BT (T221-0008) Applied Informatics, Bachelor, SO 01.10.2026 , semester 6, mandatory course
PRI-BT (T223-0001) Production Informatics, Bachelor, SO 01.10.2023 , semester 6, mandatory course
PRI-BT (T223-0001) Production Informatics, Bachelor, SO 01.10.2026 , semester 6, mandatory course

Workload:
The total student study time for this course is 360 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Studienleitung

Lecturer: Studienleitung

[*updated 07.08.2019*]

Learning outcomes:
Students
_ will be able to work independently on given (medium to difficult) subject-specific tasks within a given period of time using scientific methods.
_ will be capable of using the specialist knowledge and methods acquired during their studies to develop ways to select suitable solutions in a goal- and result-oriented manner.
_ will be able to analyze topics in cooperation with external and internal clients and colleagues, conceive their solution and implement them accordingly.
And lastly, students will be able to document the results of their work in writing according to scientific principles.

[*updated 26.02.2018*]

Module content:
The Bachelor thesis is a project from the field of research, industry or business. It is of a theoretical, programming, empirical and/or experimental nature. Students must document their thesis (or collaboration) in the project. The application-oriented, industrial project aspect (project plan, project implementation, project result) of the thesis will be taken into account.

[*updated 26.02.2018*]

Recommended or required reading:
Will be specified by the supervisor resp. researched independently based on a specific topic.

[*updated 26.02.2018*]

Computer Architecture

Module name (EN): Computer Architecture

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-RAR

Hours per semester week / Teaching method:
2V+2P (4 hours per week)

ECTS credits:
5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 26.02.2018*]

Applicability / Curricular relevance:

PIB-RAR (P221-0037) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 2, mandatory course
PIB-RAR (P221-0037) Applied Informatics, Bachelor, SO 01.10.2026 , semester 2, mandatory course
PRI-RAR (P221-0037) Production Informatics, Bachelor, SO 01.10.2023 , semester 2, mandatory course
PRI-RAR (P221-0037) Production Informatics, Bachelor, SO 01.10.2026 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
PRI-AE

[*updated 15.12.2025*]

Module coordinator:
Prof. Dr. Steffen Knapp

Lecturer: Prof. Dr. Steffen Knapp

[*updated 01.12.2022*]

Learning outcomes:
After successfully completing this module, students will understand digital circuits (switching networks, switching devices) and will be able to analyze and design them. This practical course will help students acquire the necessary experience to develop and build important applications, especially in the field of computer technology.

Students will learn how digital computers are structured, organized and how they operate. They will be able to bring the architectural elements of a computer together, at register level, to create an example architecture. By understanding command processing, addressing techniques and concepts such as pipeline and cache, the participants will acquire the necessary knowledge to understand modern computer architectures.

[*updated 26.02.2018*]

Module content:

Part I:
1. Introduction
2. Combinational circuits
 2.1 Basics
 2.2 Normal forms
 2.3 Minimization of switching functions
 2.4 Examples
3. Sequential circuits
 3.1 Flip flops
 3.2 Registers, shift registers
 3.3 Counters
 3.4 Examples

Part II:
1. Representing numbers in the computer
2. Von Neumann architecture
3. Memory components
4. Sequential control
5. Microprogramming
6. Instruction set architecture
7. Interrupt handling
8. RISC processors
9. Pipelining
10. Cache

[*updated 26.02.2018*]

Recommended or required reading:
Part I:
Borgmeyer: Grundlagen der Digitaltechnik, Hanser-Verlag, 2001
Borucki: Grundlagen der Digitaltechnik, Teubner-Verlag, 2000
Beuth: Digitaltechnik, Vogel Verlag, 2003
Urbanski: Digitaltechnik, Springer Verlag, 2004

Part II:
W. Schiffmann, R. Schmitz: Technische Informatik 2, Springer-Verlag, Berlin, 1999
K. Wüst, Mikroprozessortechnik, Vieweg-Verlag, Braunschweig, 2003
H. Malz, Rechnerarchitektur, Vieweg-Verlag, Braunschweig, 2004
J. L. Hennessy, D. A. Patterson: Rechnerarchitektur Analyse, Entwurf, Implementierung und Bewertung, Vieweg-Verlag, Braunschweig, 2004
P. Herrmann : Rechnerarchitektur _ Aufbau Organisation und Implementierung, Vieweg-Verlag, Braunschweig, 2000

[*updated 26.02.2018*]

Computer Networks

Module name (EN): Computer Networks

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-RN

Hours per semester week / Teaching method:

2V+2P (4 hours per week)

ECTS credits:
5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 26.02.2018*]

Applicability / Curricular relevance:

BMT2551.RN Biomedical Engineering, Bachelor, ASPO 01.10.2018 , optional course, medical/technical
BMT2551.RN Biomedical Engineering, Bachelor, SO 01.10.2025 , optional course, medical/technical
DFIW-RN (P610-0192) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2019 , semester 4, mandatory course
KIB-RN (P222-0037) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 3, mandatory course
KIB-RN (P222-0037) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 3, mandatory course
PIB-RN (P221-0038) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, mandatory course
PIB-RN (P221-0038) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, mandatory course
PRI-RN (P222-0037) Production Informatics, Bachelor, SO 01.10.2023 , semester 3, mandatory course
PRI-RN (P222-0037) Production Informatics, Bachelor, SO 01.10.2026 , semester 3, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Steffen Knapp

Lecturer: Prof. Dr. Steffen Knapp

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be familiar with the functionality and data structures of the basic Internet protocol families between LAN and application level. They will be able to describe the communication in a TCP/IP computer network and use this knowledge for troubleshooting.

[*updated 26.02.2018*]

Module content:
1. Computer communication
1.1. Models
1.2. LAN
1.3. IP/ICMP
1.4. UDP
1.5. TCP

2. Selected application layer Internet protocols

3. Using network tools

[*updated 26.02.2018*]

Recommended or required reading:
Kurose, Ross, Computernetzwerke, Pearson, 2012
D. Comer, Computer Networks and Internets: Global Edition, Pearson, 2015

[*updated 26.02.2018*]

Databases

Module name (EN): Databases

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-DB

Hours per semester week / Teaching method:
3V+1P (4 hours per week)

ECTS credits:
5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam, Duration 120 min.

[*updated 13.10.2024*]

Applicability / Curricular relevance:

DFBI-323 (P610-0219) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018 , semester 3, mandatory course
DFIW-DB (P610-0183) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2019 , semester 3, mandatory course
KIB-DB (P222-0009) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 3, mandatory course
KIB-DB (P222-0009) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 3, mandatory course
PIB-DB (P221-0018) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 3, mandatory course
PIB-DB (P221-0018) Applied Informatics, Bachelor, SO 01.10.2026 , semester 3, mandatory course
PRI-DB (P222-0009) Production Informatics, Bachelor, SO 01.10.2023 , semester 3, mandatory course
PRI-DB (P222-0009) Production Informatics, Bachelor, SO 01.10.2026 , semester 3, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus Berberich

Lecturer: Prof. Dr. Klaus Berberich

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this module, students will be able to use relational database systems in practice. To do so, they will learn data modelling techniques and be able to apply them to problems in real life. Students will understand the relational model and relational algebra as the mathematical foundations of relational database systems. They will be capable of deriving a relational schema from a modelled section from the real world. Students will be able to assess its quality on the basis of relational normal forms (1NF, 2NF, 3NF) and improve it if necessary by converting it into a higher normal form. They will also be able to formulate concrete information requirements as expressions of relational algebra. Students will be familiar with the essential commands of the Structured Query Language (SQL) and can use them to change the schema of a database and the data stored in it. In addition, they will also be able to express a given need for information as a query in SQL and to understand and communicate a given SQL query. Students will understand the central concept of the transaction and can define each of the ACID properties and illustrate them with examples. They will be able to name different types of indexes in relational database systems and can use them depending on the situation. In order to solve more complex problems with the help of a relational database system, students will be familiar with the basic language components of procedural extensions (e. g. Oracle PL/SQL and Microsoft TransactSQL) of SQL. In addition, students will be familiar with interfaces (e. g. ODBC and JDBC) for accessing a relational database system from an application. They will be capable of accessing an existing relational database from a programming language known to them (e. g. Java, Python or C) by means of these interfaces. Finally, students will know alternatives to relational databases (e. g. document-oriented databases and graph databases) and can name differences.

[*updated 13.10.2024*]

Module content:
1. Introduction
2. Database design
3. Relational model and relational algebra
4. Structured Query Language (SQL)
5. Relational design theory
6. Data integrity
7. Transaction management
8. Database tuning
9. Security aspects
10. Programming with SQL
11. Database interfaces
12. Non-relational databases

[*updated 13.10.2024*]

Teaching methods/Media:
Transparencies, script, example databases in SQLite, practical and theoretical exercises.

[*updated 13.10.2024*]

Recommended or required reading:
Kemper Alfons und Eickler André: Datenbanksysteme - Eine Einführung, De Gruyter, 2015

Saake Gunter und Sattler Kai-Uwe: Datenbanken - Konzepte und Sprachen, mitp Professional, 2018

Wiese Lena: Advanced Data Management, De Gruyter, 2015

[*updated 13.10.2024*]

Informatics 1

Module name (EN): Informatics 1

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-INF1

Hours per semester week / Teaching method:
2V+2U (4 hours per week)

ECTS credits:
5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 19.02.2018*]

Applicability / Curricular relevance:

KIB-INF1 (P222-0016) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 1, mandatory course
KIB-INF1 (P222-0016) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 1, mandatory course
PRI-INF1 (P222-0016) Production Informatics, Bachelor, SO 01.10.2023 , semester 1, mandatory course
PRI-INF1 (P222-0016) Production Informatics, Bachelor, SO 01.10.2026 , semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
PRI-PRG2.

[*updated 12.12.2025*]

Module coordinator:
Prof. Dr. Damian Weber

Lecturer: Prof. Dr. Damian Weber

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be able to use the basic concepts of algorithms and data structures in a targeted manner.
They will understand the representation of data in a computer and can use it in data structures to solve problems. Through the use of a Random Access Machine machine model they will gain become acquainted with the basic operations a computer can perform. They will be able to accurately express problems and analyze simple algorithmic problems to develop solutions. They will be able to asymptotically estimate the effort required for the solution.

The related techniques will be learned and intensified in theoretical training sessions by means of independent work.

[*updated 19.02.2018*]

Module content:
1. Mathematic principles
1.1 Number systems
1.2 Boolean algebra

2. Random Access Machine machine model
2.1 Structure

2.2 Program correctness
2.3 Program runtime

3. Data structures
3.1 Arrays
3.2 Lists
3.3 Heaps
3.4 Hash tables
3.5 Search trees

4. Algorithms
4.1 High-level programming languages
4.2 Recursion
4.3 Sorting

[*updated 19.02.2018*]

Teaching methods/Media:
RAMses, a RAM simulator

[*updated 19.02.2018*]

Recommended or required reading:
Cormen Th., Leiserson Ch., Rivest R., Introduction to Algorithms, Oldenbourg, 2013
Sedgewick R., Wayne K., Algorithmen und Datenstrukturen, Pearson Studium, 2014

[*updated 19.02.2018*]

Informatics 2

Module name (EN): Informatics 2

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-INF2

Hours per semester week / Teaching method:
2V+2U (4 hours per week)

ECTS credits:
5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 19.02.2018*]

Applicability / Curricular relevance:

KIB-INF2 (P222-0017) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 2, mandatory course
KIB-INF2 (P222-0017) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 2, mandatory course
PRI-INF2 (P222-0017) Production Informatics, Bachelor, SO 01.10.2023 , semester 2, mandatory course
PRI-INF2 (P222-0017) Production Informatics, Bachelor, SO 01.10.2026 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer: Prof. Dr. Damian Weber

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will understand the formulation of different algorithmic problems as a graph problem.

Students will be able to solve graph problems algorithmically. The knowledge about data structures and basic algorithmic techniques acquired in the course "Informatics 1" will be applied to solve these problems. In this way, students will acquire the skills required to analyze more complex algorithms.

Finally, an intuitive introduction to important complexity classes will provide the basis for understanding the algorithmic solvability of problems. The approaches of Greedy algorithms and dynamic programming will be understood as techniques for solving difficult algorithmic problems approximately and efficiently. By analyzing the consumption of resources, students will be able to decide for individual problems whether efficient, exact or heuristic procedures are available for solving them.

[*updated 26.02.2018*]

Module content:
1. Graphs
1.1 Data structures
1.2 Basic algorithms
1.3 Shortest paths
1.4 Connected components

2. Problem solving techniques
2.1 Dynamic programming

2.2 Greedy algorithms
2.3 Analytical techniques of approximate methods

[*updated 19.02.2018*]

Teaching methods/Media:

[*updated 19.02.2018*]

Recommended or required reading:
Cormen Th., Leiserson Ch., Rivest R., Introduction to Algorithms, Oldenbourg, 2013
Sedgewick R., Wayne K., Algorithmen und Datenstrukturen, Pearson Studium, 2014

[*updated 19.02.2018*]

Manufacturing Process Technology (with Lab Course)

Module name (EN): Manufacturing Process Technology (with Lab Course)

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-TFL

Hours per semester week / Teaching method:
3V+2U (5 hours per week)

ECTS credits:
5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 120 min. (graded)
Lab experiment (evaluated)

[*updated 05.11.2020*]

Applicability / Curricular relevance:

MAB_19_A_2.02.TFL (P241-0286, P241-0287) Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019 , semester 2, mandatory course
MAB_24_A_2.02.TFL Mechanical and Process Engineering, Bachelor, SO 01.10.2024 , semester 2,

mandatory course
PRI-TFL (P241-0286, P241-0287) Production Informatics, Bachelor, SO 01.10.2023 , semester 2, mandatory course
PRI-TFL (P241-0286, P241-0287) Production Informatics, Bachelor, SO 01.10.2026 , semester 2, mandatory course

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 93.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer: Prof. Dr. Jürgen Griebsch

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be familiar with important manufacturing processes and the machine tools used.
They will be familiar with the characteristics and possible applications of the manufacturing processes according to DIN 8550.
Students will be able to select a process based on technical criteria for a production task and by weighing up the advantages and disadvantages.
They will be able to outline manufacturing chains for simple tasks.
Students will be familiar with the practical application of selected manufacturing processes according to DIN 8550.

[*updated 05.11.2020*]

Module content:
The quality and efficiency of industrial production depends on choosing the right manufacturing process and understanding that process. That is why knowledge about the various technologies is one of a production engineers important tools.
Basic components of manufacturing processes according to DIN 8550 are:
- Primary processing (e.g. casting)
- Forming
- Cutting
- Coating
- Modifying

We will also discuss joining to a limited extent, but it is one of the main focuses of the 5th semester in the lecture "Joining Techniques with Integrated Lab Course".

The content of the course is based on a roughly defined industrial process and will prepare students for the production engineering lab that accompanies the lecture.

The lecture will be combined with smaller practical exercises where students can work on topics, present them briefly and then discussion them.

[*updated 05.11.2020*]

Teaching methods/Media:
- Lecture with exercises and calculations on the blackboard
- Lab - Practical course

[*updated 05.11.2020*]

Recommended or required reading:
Spur, G.; Handbuch Fertigungstechnik in 5 Bänden; Hanser Verlag, 2016

Fritz, A.-H.; Fertigungstechnik; Springer Verlag, 2018; ISBN: 978-3-662-56535-3

Gebhardt, A.; Additive Fertigungsverfahren; Hanser Verlag, 2016; ISBN: 978-3-446-44539-0

Geiger, Walter / Kotte, Willi; "Handbuch Qualität, Grundlagen und Elemente des Qualitätsmanagements: Systeme _ Perspektiven"; ISBN: 978-3-8348-0273-6

Keferstein, Claus P. / Dutschke, Wolfgang; "Fertigungsmesstechnik Praxisorientierte Grundlagen, moderne Messverfahren"; ISBN: 978-3-8351-0150-0

Tschätsch, Heinz; "Praxis der Zerspantechnik - Verfahren, Werkzeuge, Strahlquellen, Systeme, Fertigungsverfahren; ISBN: 978-3-8351-0005-3

Ralf Berning; "Grundlagen der Produktion: Produktionsplanung und Beschaffungsmanagement (Taschenbuch)"; ISBN: 978-3464495131

König, Klocke; "Fertigungsverfahren 1-5: Fertigungsverfahren 1. Drehen, Fräsen, Bohren: Drehen, Frasen, Bohren: Bd 1 (Gebundene Ausgabe)"; ISBN: 978-3540234586

Fritz, Schulze; "Fertigungstechnik (VDI)"; ISBN: 978-3540766957

Westkämper, Engelbert / Warnecke, Hans-Jürgen; "Einführung in die Fertigungstechnik"; ISBN: 978-3-8351-0110-4

Habenicht, Gerd; "Kleben - erfolgreich und fehlerfrei - Handwerk, Praktiker, Ausbildung, Industrie"; ISBN: 978-3-8348-0019-0

Hügel, Helmut / Graf, Thomas; "Laser in der Fertigung (Arbeitstitel)- Strahlquellen, Systeme, Fertigungsverfahren; ISBN: 978-3-8351-0005-3

Ralf Berning; "Grundlagen der Produktion: Produktionsplanung und Beschaffungsmanagement (Taschenbuch)"; ISBN: 978-3464495131

König, Klocke; "Fertigungsverfahren 1-5: Fertigungsverfahren 1. Drehen, Fräsen, Bohren: Drehen, Frasen, Bohren: Bd 1 (Gebundene Ausgabe)"; ISBN: 978-3540234586

[*updated 05.11.2020*]

Mathematics 1

Module name (EN): Mathematics 1

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-MAT1

Hours per semester week / Teaching method:
4V+2U (6 hours per week)

ECTS credits:
7

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 19.02.2018*]

Applicability / Curricular relevance:

KIB-MAT1 (P221-0001) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 1, mandatory course
KIB-MAT1 (P221-0001) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 1, mandatory course
PIB-MA1 (P221-0001) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 1, mandatory course
PIB-MA1 (P221-0001) Applied Informatics, Bachelor, SO 01.10.2026 , semester 1, mandatory course
PRI-MAT1 (P221-0001) Production Informatics, Bachelor, SO 01.10.2023 , semester 1, mandatory course
PRI-MAT1 (P221-0001) Production Informatics, Bachelor, SO 01.10.2026 , semester 1, mandatory course

Workload:
90 class hours (= 67.5 clock hours) over a 15-week period.
The total student study time is 210 hours (equivalent to 7 ECTS credits).
There are therefore 142.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Peter Birkner

Lecturer: Prof. Dr. Peter Birkner

[*updated 07.08.2019*]

Learning outcomes:
Students will learn basic mathematical concepts from the areas of predictive logic, sets and figures and be able to use them confidently when formulating mathematical statements.
Students will be able to reproduce basic formulas from the field of combinatorics and use these to develop solutions for combinatoric problems.
They will be capable of explaining the mathematical proof concepts of direct proof, indirect proof and complete induction and thus, come up with new evidence.
They will be able to enumerate the axioms of the algebraic structures group, ring and field and check the corresponding properties for structures with given operations.
Students will learn the terms and statements of group theory and be able to identify them in examples of groups, such as (Z/mZ, +) and ((Z/pZ)\{0}, *).
They will be able to explain vector space axioms and demonstrate them in Euclidean space.
Students will be able to develop solutions in Euclidean space for geometrical problems using vector algebra, the dot product, the vector product and the triple product.
They will be able to explain basic concepts of the theory of n-dimensional vector spaces.
They will have mastered elementary matrix calculation rules and determinant calculation rules and learn how linear images can be represented and handled using matrices.
Students will be able to demonstrate how to solve a linear system and learn to master the Gauss algorithm as a method for solving linear systems.
Finally, students will gain an insight into the manifold applications of mathematics in computer science (the development of programming languages, program verification, digital technology, computing accuracy on computers, cryptography, computer graphics_).

[*updated 19.02.2018*]

Module content:
Basic mathematical terms
- Propositional logic, first-order logic, sets, especially uncountably infinite sets
- Relations, especially equivalence relations, partitions, functions

Algebraic structures
- Semigroups, monoids
- Groups, subgroups, normal subgroups, quotient groups, homomorphisms
- Rings, fields, in particular Z/mZ

Natural numbers, mathematical induction, recursion
- Peano axioms
- Mathematical induction
- Recursive definitions
- Binominal coefficients and binomial formulae
- Basic concepts of combinatorics (with quantitative considerations)

Elementary vector calculation in Euclidean space
- Vector algebra, linear independence, dimension
- Vectors in coordinate systems, dot product, vector product, triple product
- Geometric applications

Vectors in n-dimensional space
- Generating sets, basis, subspaces
- Linear functions, image space, core

Representation of linear functions with matrices
Geometric applications: projections, reflections, rotations
Matrices and linear systems
Linear systems, Gaussian elimination
Square matrices, matrix inversion, determinants, Cramer´s rule

[*updated 26.02.2018*]

Teaching methods/Media:
Lecture. An exercise sheet will be distributed every week and then discussed in small groups the following week. In addition, a tutorial will be available for work in small groups. This is voluntary. In the tutorials, students will be able work on exercises themselves (with support from the tutor, if necessary) and ask questions about the lecture material. The tutorial can also be used to fill knowledge gaps.

[*updated 26.02.2018*]

Recommended or required reading:
- P. Hartmann, Mathematik für Informatiker (Vieweg); can be downloaded via OPAC as a PDF.
- M. Brill, Mathematik für Informatiker (Hanser).

[*updated 26.02.2018*]

Mathematics 2

Module name (EN): Mathematics 2

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-MAT2

Hours per semester week / Teaching method:
3V+1U (4 hours per week)

ECTS credits:
5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 19.02.2018*]

Applicability / Curricular relevance:

KIB-MAT2 (P221-0002) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 ,

semester 2, mandatory course
KIB-MAT2 (P221-0002) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 2, mandatory course
PIB-MA2 (P221-0002) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 2, mandatory course
PIB-MA2 (P221-0002) Applied Informatics, Bachelor, SO 01.10.2026 , semester 2, mandatory course
PRI-MAT2 (P221-0002) Production Informatics, Bachelor, SO 01.10.2023 , semester 2, mandatory course
PRI-MAT2 (P221-0002) Production Informatics, Bachelor, SO 01.10.2026 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Peter Birkner

Lecturer: Prof. Dr. Peter Birkner

[*updated 07.08.2019*]

Learning outcomes:
_ After successfully completing this module, students will be familiar with the definition of the term _limit_ for sequences and real functions and will
have learned to master the use of limit theorems.
_ They will know the convergence criteria for series and be able to handle them confidently when checking series for convergence.
_ They will be able to explain the importance of series expansion for numerical mathematics and computer science applications.
_ Students will be familiar with the properties of exponential and logarithmic functions and be able to deal with them confidently
in computer science applications.
_ They will know the definition of derivation for functions of a variable as a limit value and
will have learned to master the derivation rules for functions of a variable.
_ Students will be able to develop solutions for the application of differential calculus (setting limits with _L´Hospital´s rule, extreme value tasks, Taylor series
and error estimation).
_ They will be familiar with the definition of definite and indefinite integrals for variable functions, as well as
be able to develop integration solutions using the integration methods _partial integration_ and
integration by substitution.
_ Finally, they will have learned to master complex numbers in the usual forms for representation.

[*updated 24.02.2018*]

Module content:
Sequences and series
Supremum, infimum, limits, limit theorems
Series, direct comparison test and ratio test

Geometric series, exponential series
Continuity
Function limits
Properties of continuous functions
Inverse functions, logarithms, inverse trigonometric functions
Differential calculus
Concept of derivation, calculation rules
Properties of differentiable functions
Higher derivatives
Monotonicity and convexity
Applications such as Hospital´s rule, extreme value tasks and Taylor series
Integral calculus
Riemann sums, definite integral
Indefinite integral, fundamental theorem of calculus
Integration methods: partial integration, substitution rule
Complex numbers

[*updated 24.02.2018*]

Teaching methods/Media:
Lecture at board Every two weeks an exercise sheet will be distributed and then discussed in small groups the following week. In addition, a tutorial will be offered every two weeks for work in small groups. This is voluntary. In the tutorials, students will be able work on exercises themselves (with support from the tutor, if necessary) and ask questions about the lecture material. The tutorial can also be used to fill knowledge gaps.

[*updated 26.02.2018*]

Recommended or required reading:
- P. Hartmann, Mathematik für Informatiker (Vieweg); can be downloaded via OPAC as a PDF.
- M. Brill, Mathematik für Informatiker (Hanser).

[*updated 19.02.2018*]

Mathematics 3

Module name (EN): Mathematics 3

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-MAT3

Hours per semester week / Teaching method:
2V+1U (3 hours per week)

ECTS credits:
3

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 26.02.2018*]

Applicability / Curricular relevance:

KIB-MAT3 (P222-0002) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 3, mandatory course
KIB-MAT3 (P222-0002) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 3, mandatory course
PRI-MAT3 (P222-0002) Production Informatics, Bachelor, SO 01.10.2023 , semester 3, mandatory course
PRI-MAT3 (P222-0002) Production Informatics, Bachelor, SO 01.10.2026 , semester 3, mandatory course

Workload:
45 class hours (= 33.75 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 56.25 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Peter Birkner

Lecturer: Prof. Dr. Peter Birkner

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be able to apply the Fourier transform to technical problems such as the analysis of linear filters. They will be able to understand problems related to the functions of several independent variables and to design solutions.

With the help of an introduction to probability calculus, they will be able to process and solve elementary combinatorial and probabilistic questions.

[*updated 26.02.2018*]

Module content:
Complex numbers (advanced)
Fourier series and Fourier transform
  Definitions, properties, examples
  Applications
Functions with several independent variables
  n-dimensional space
  Multivariate function
  Differential calculus
Probability calculus

The concept of "probability"
Conditional probability and independent events
Urn experiments
Random variables and distribution functions
Expected value and variance
Discrete distribution, Poisson distribution, normal (or Gaussian) distribution

[*updated 26.02.2018*]

Recommended or required reading:

[*still undocumented*]

Operating Systems

Module name (EN): Operating Systems

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-BS

Hours per semester week / Teaching method:
2V+2P (4 hours per week)

ECTS credits:
5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 90 min.

[*updated 19.02.2018*]

Applicability / Curricular relevance:

DFIW-BS (P610-0191) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2019 , semester 4, mandatory course
KIB-BS (P222-0007) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 4, mandatory course
KIB-BS (P222-0007) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 3, mandatory course
PIB-BS (P221-0013) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, mandatory course
PIB-BS (P221-0013) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, mandatory course
PRI-BS (P222-0007) Production Informatics, Bachelor, SO 01.10.2023 , semester 3, mandatory course
PRI-BS (P222-0007) Production Informatics, Bachelor, SO 01.10.2026 , semester 3, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Steffen Knapp

Lecturer: Prof. Dr. Steffen Knapp

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this module, students will be familiar with the typical structure and principles of operating systems and alternatives in development. In addition, they will also understand the maintenance strategies of the respective resources and the mechanisms of scheduling and process synchronization. They will be able to apply the contexts they have learned to other operating systems and environments.

[*updated 01.07.2021*]

Module content:
Introduction, Operating system concepts
Memory management, paging
Process management, competing processes
Scheduling
Synchronization
Virtualization

[*updated 01.07.2021*]

Teaching methods/Media:
Combination of lecture and practical course/tutorial/exercises
Lecture slides, exercises, sample solutions

[*updated 01.07.2021*]

Recommended or required reading:
J. Nehmer, P. Sturm: Systemsoftware-Grundlagen moderner Betriebssysteme, Punkt 2001
A. Tanenbaum, H. Bos: Moderne Betriebssysteme, Pearson Studium 2016
W. Stallings: Operating Systems, Prentice Hall, 2014
A. Silberschatz et al.: Operating System Concepts, Wiley, 2008

[*updated 01.07.2021*]

Production and Quality Management

Module name (EN): Production and Quality Management

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-PUQ

Hours per semester week / Teaching method:
2V+1P (3 hours per week)

ECTS credits:
3

Semester: 5

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 90 min.

[*updated 05.11.2020*]

Applicability / Curricular relevance:

MAB_19_IP_5.05.MST (P241-0278, P241-0279) Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019 , semester 5, mandatory course, Specialization Industrial Production
PRI-PUQ (P223-0010) Production Informatics, Bachelor, SO 01.10.2023 , semester 5, mandatory course
PRI-PUQ (P223-0010) Production Informatics, Bachelor, SO 01.10.2026 , semester 5, mandatory course

Workload:
45 class hours (= 33.75 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 56.25 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer: Prof. Dr. Jürgen Griebsch

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this module, students will be able to master tasks from the fields of technical investment and production planning using their knowledge about production management. They will be able to determine machine availability and machine utilization.

Students will be able to draw up key figure models and interpret them.
They will be familiar with common fields of application in industrial assembly and understand the different

assembly principles.
Students will be familiar with the planning, construction and organization of assembly systems.
They will be familiar with the different feeding, transport, handling and gripping systems.
Students will be familiar with the basic principles of quality management and will be able to apply its methods and tools.
They will be able to analyze technical risks and problems.

[*updated 05.11.2020*]

Module content:
Introduction to production management
- Production systems
- Value stream design
- Machine availability
- Key figure systems

Assembly system technology:
- Industrial robots and handling technology
- Basic tasks of the assembly system technology
- Transport systems
- Assembly organization

Introduction to quality management
- Methods and tools for quality management
- Certification, auditing

Machine safety (CE conformity, machinery directive, hazard and risk analysis)

[*updated 05.11.2020*]

Teaching methods/Media:
Instruction with practically-oriented exercise segments, laboratory in small groups

[*updated 05.11.2020*]

Recommended or required reading:
Erlach, K.; Wertstromdesign - Der Weg zur schlanken Fabrik; Springer Verlag, 2010; ISBN: 978-3-540-89866-5

Dickmann, P.; Schlanker Materialfluss; Springer Verlag, 2015; ISBN 978-3-662-44869-4

Coenenberg, A.G., Fischer, T.M., Günther, T.; Kostenrechnung und Kostenanalyse; Schäffer-Poeschel, 2012; ISBN: 978-3-7910-3612-0

Haun, M.; Handbuch Robotik _ Programmieren und Einsatz intelligenter Roboter, Springer Verlag 2013; ISBN 978-3-642-39858-2

Hesse, S., Malisa, V.; Taschenbuch Robotik - Montage - Handhabung; Hanser Verlag, 2016; ISBN: 978-3-446-44365-5

Linß, G.; Qualitätsmanagement für Ingenieure; Hanser Verlag, 2018; ISBN: 978-3-446-44042-5

[*updated 05.11.2020*]

Project Management

Module name (EN): Project Management

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-PM

Hours per semester week / Teaching method:
2V (2 hours per week)

ECTS credits:
3

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 19.02.2018*]

Applicability / Curricular relevance:

KI567 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014 , semester 6, optional course, technical
KIB-PM (P222-0032) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 2, mandatory course
KIB-PM (P222-0032) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 2, mandatory course
PIB-PM (P221-0036) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 3, mandatory course
PIB-PM (P221-0036) Applied Informatics, Bachelor, SO 01.10.2026 , semester 3, mandatory course
PRI-PM (P222-0032) Production Informatics, Bachelor, SO 01.10.2023 , semester 2, mandatory course
PRI-PM (P222-0032) Production Informatics, Bachelor, SO 01.10.2026 , semester 4, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Steffen Knapp

Lecturer: Prof. Dr. Steffen Knapp

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this course, students will be able to reconstruct the project planning for typical and manageable student IT projects in functional project management.

They will be capable of independently implementing an adequate form of project organization and exercising project governance during the continuous project development cycle. They will be able to recognize deviations from the plan and adjust project planning accordingly.

Students will learn to use basic project management tools, i. e. they can create work-breakdown structures, map workflows with the precedence diagram method and understand the consequences of plan changes.

They will learn to prepare and conduct meetings and to communicate their information and the results for efficient project control.

Students will become familiar with estimation processes for IT projects and know how to use them in such projects in order to stabilize project planning.

They will develop an understanding of how to work in project teams and assume project management functions.

[*updated 19.02.2018*]

Module content:
Definitions of project and project management
Projects and project management in companies
Project management tools
Special features of software projects
- Information and communication
- Cost estimation
- Collaborative software

[*updated 19.02.2018*]

Teaching methods/Media:
Lecture, simulations and workshop
Lecture script available as a PDF download

[*updated 19.02.2018*]

Recommended or required reading:
BURGHARDT M.: Projektmanagement, Publics MCD Verlag, 2000
WESTERMANN R.: Projektmanagement mit System, Gabler Verlag, 2001
MOTZEL E.+PANNENBÄCKER O.:Projektmanagement-Kanon, Roderer Verlag, 2002 TURNER M.: Microsoft Solutions Framework Essentials; Building Successful Technology Solutions, Microsoft Press ISBN-10:0-7356-2353-8
WIECZORREK W., MERTENS P.: Management von IT-Projekten, SpringerLink Verlag ISBN-978-3-642-16126-1
BOHINC T.: Führung im Projekt, SpringerLink Verlag ISBN-978-3-642-22625-0 BERGMANN R, BARRECHT M.: Organisation und Projektmanagement, SpringerLink Verlag ISBN-978-3-7908-2017-1
KÖNIGS H.-P.: IT-Risikomanagement mit System, SpringerLink Verlag ISBN-ISBN 978-3-8348-1687-0

[*updated 19.02.2018*]

Scientific Work

Module name (EN): Scientific Work

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-WA

Hours per semester week / Teaching method:
1V+1U (2 hours per week)

ECTS credits:
2

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:

[*still undocumented*]

Applicability / Curricular relevance:

PIB-WA (P221-0046) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, mandatory course
PIB-WA (P221-0046) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, mandatory course
PRI-WA Production Informatics, Bachelor, SO 01.10.2026 , semester 4, mandatory course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Peter Birkner

Lecturer: Prof. Dr. Peter Birkner

[*updated 20.11.2025*]

Learning outcomes:
After successfully completing this module, students will be able to describe and explain how scientific work works, especially in computer science. In doing so, they will be able to use their knowledge to carry out searches and document arguments in writing as well as with the help of quotations. In addition, students will be able to use the most common scientific documentation tools.

[*updated 24.02.2018*]

Module content:
Methodical and technical basics will first be taught and then intensified through practical exercises. Exams will be conducted parallel within the framework of the exercises, which students will work on independently.

1. Principles of science
2. Forms of science in Informatics
3. Scientific activity in Informatics
4. Research: goals, methodology, sources
5. Arguing and quoting
6. Tools for scientific documentation
7. Articulating scientific results
8. Selected special topics

[*updated 24.02.2018*]

Teaching methods/Media:
Transparencies, projector, board, discussions, theoretical and practical exercises

[*updated 24.02.2018*]

Recommended or required reading:
Martin Kornmeier: Wissenschaftlich Schreiben leicht gemacht, utb, 2013.
Marcus Deininger, Horst Lichter, Jochen Ludewig, Kurt Schneider: Studien-Arbeiten: Ein Leitfaden zur Vorbereitung, Durchführung und Betreuung von Studien-, Diplom- und Doktorarbeiten am Beispiel Informatik. Teubner, 5. Auflage 2005.
Justin Zobel: Writing for Computer Science. Springer, 3. Auflage 2014.
Barbara Minto: Das Prinzip der Pyramide. Pearson Studium, 2005.
Gene Zelazny: Say it with Presentations. McGraw-Hill, 2006.
Tobias Oetiker: The Not So Short Introduction to LaTeX

[*updated 24.02.2018*]

Security Engineering

Module name (EN): Security Engineering

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-SE

Hours per semester week / Teaching method:
2V+2P (4 hours per week)

ECTS credits:

5

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam

[*updated 26.02.2018*]

Applicability / Curricular relevance:

DFIW-SE (P610-0194) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2019 , semester 4, mandatory course
KIB-SE (P222-0039) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 4, mandatory course
KIB-SE (P222-0039) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 4, mandatory course
PIB-SE (P222-0039) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, mandatory course
PIB-SE (P222-0039) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, mandatory course
PRI-SE (P222-0039) Production Informatics, Bachelor, SO 01.10.2023 , semester 4, mandatory course
PRI-SE (P222-0039) Production Informatics, Bachelor, SO 01.10.2026 , semester 4, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer: Prof. Dr. Damian Weber

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this module, students will be familiar with the critical parts, procedures and audit-relevant data of an operating system.
An open source UNIX system will be used in order to be able to comprehensively analyze processes, security gaps and system calls in detail. The knowledge of these components and their weak points will enable the students to pursue a security-by-design approach for new application systems or the configuration of operating systems, which prevents vulnerabilities from the outset.
This includes basic knowledge of current cryptography methods. Students will learn to integrate the social

necessity of data protection and privacy protection in communication processes into their future concepts.

[*updated 26.02.2018*]

Module content:
1. Security terms, threat model, examples
2. Identities, authentication, authorization
3. Encryption (symmetric, asymmetric)
4. Cryptographic hash functions, message authentication codes
5. UNIX from a security perspective
6. Auditing, system status, system statistics
7. Network security, perimeter security
8. Penetration tests

[*updated 26.02.2018*]

Recommended or required reading:
D. Kim, M. G. Solomon, Fundamentals Of Information Systems Security, 2016
G. Weidman, Penetration Testing: A Hands-On Introduction to Hacking, 2014
https://www.sans.org/
http://www.securityfocus.com/vulnerabilities

[*updated 26.02.2018*]

Technical Mechanics in Production Environments

Module name (EN): Technical Mechanics in Production Environments

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-TM

Hours per semester week / Teaching method:
2V+2U (4 hours per week)

ECTS credits:
5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam, 120 min.
Resources: 1 double-sided, handwritten A4 sheet of paper, non-programmable calculator

[*updated 08.08.2024*]

Applicability / Curricular relevance:

PRI-TM (P223-0002) Production Informatics, Bachelor, SO 01.10.2023 , semester 1, mandatory course
PRI-TM (P223-0002) Production Informatics, Bachelor, SO 01.10.2026 , semester 3, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. John Heppe

Lecturer: Prof. Dr.-Ing. John Heppe

[*updated 01.12.2022*]

Learning outcomes:
After successfully completing this module, students will be able to:

- analyze static problems and apply the relevant mathematical relationships to them
- calculate the durability of components and mechanical system structures from industrial production
- present their own solutions in technical mechanics from the field of production informatics in a clear and comprehensible way

[*updated 08.08.2024*]

Module content:
- Introduction:
- Mechanics Axioms: Force systems and moments
- Basic static operations

B. Statics
- Equilibrium conditions
- Free body diagrams and supports
- Center of mass

C. Technical Mechanics
- Definition stress/strength
- Strength calculations
- Comparison of point load/line load
- Shear force, bending moment diagram
- Chronological sequence of a stress
- Moment of inertia/moment of resistance
- Forces and moments in production, e.g. in actuators

[*updated 08.08.2024*]

Teaching methods/Media:
Course mit practical examples

[*updated 08.08.2024*]

Recommended or required reading:
- K.D. Arndt, H. Brüggemann, J. Ihme, Festigkeitslehre für Wirtschaftsingenieure, Springer Lehrbuch
- S. Labisch, G. Wählisch, Technisches Zeichnen, 5. Auflage, Springer Verlag 2017
- Schaeffler, Technisches Taschenbuch (wird ausgeteilt)
- H.A. Richard, M. Sander, Technische Mechanik, Festigkeitslehre, Vieweg
- Läpple, V. Einführung in die Festigkeitslehre, Vieweg Verlag

[*updated 08.08.2024*]

Technical Reading and Writing

Module name (EN): Technical Reading and Writing

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-TRW

Hours per semester week / Teaching method:
2S (2 hours per week)

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
English

Assessment:
Written exam

[*updated 19.02.2018*]

Applicability / Curricular relevance:

KIB-ENG2 (P222-0043) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 2, mandatory course
KIB-ENG2 (P222-0043) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 2, mandatory course
PIB-EN2 (P221-0196) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 2, mandatory course

PIB-TRW Applied Informatics, Bachelor, SO 01.10.2026 , semester 1, mandatory course
PRI-TRW (P222-0043) Production Informatics, Bachelor, SO 01.10.2023 , semester 2, mandatory course
PRI-TRW (P222-0043) Production Informatics, Bachelor, SO 01.10.2026 , semester 1, mandatory course

Suitable for exchange students (learning agreement)

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dipl.-Übers. Betina Lang

Lecturer: Dipl.-Übers. Betina Lang

[*updated 07.08.2019*]

Learning outcomes:
Note:
The modules "Business Communication and Intercultural Competence", "Technical Reading and Writing", as well as "Professional Presentations" should be seen in conjunction with one another. They offer students a framework to further develop their English language skills in a professionally related area from the desired entry level B1 to level B2.

About the "Technical Reading and Writing" module:
After successfully completing this module, students will be familiar with different reading strategies and will be able to apply them to course-specific specialist texts. They will have extended their repertoire of linguistic structures and will be able to apply these structures to the written elaboration of technical questions and documents.

[*updated 12.04.2018*]

Module content:
- General and detailed comprehension of course-specific specialist texts
- Techniques for taking notes
- Summarizing texts
- Describing for example, program actions, program functions, instructions, etc.
- Cause-effect relationships

In addition, we will work on:
- Vocabulary
- Repeating relevant grammatical structures

[*updated 12.04.2018*]

Teaching methods/Media:
Teaching and learning materials (print, audio, video), multimedia teaching and learning software for specific target groups

[*updated 19.02.2018*]

Recommended or required reading:
Students will receive a list of recommended teaching and learning materials.
The following materials are free of charge for students of the htw saar. We recommend their use for independent learning:

Christine Sick (2015): TechnoPlus Englisch VocabApp (Mobile learning offer, especially for basic vocabulary, all levels), EUROKEY.

Christine Sick, unter Mitarbeit von Miriam Lange (2011): TechnoPlus Englisch 2.0 (Multimediales Sprachlernprogramm für Technisches und Business Englisch, Niveau B1-B2+), EUROKEY.

[*updated 26.02.2018*]

Work Experience Phase

Module name (EN): Work Experience Phase

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-PRA

Hours per semester week / Teaching method:
-

ECTS credits:
15

Semester: 6

Mandatory course: yes

Language of instruction:
German

Assessment:
Study report (10-15 Seiten), presentation (ca. 15 min.)

[*updated 17.04.2025*]

Applicability / Curricular relevance:

DFIW-PRA (S610-0210) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2019 , semester 6, mandatory course
KIB-PRA (S222-0026) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 6, mandatory course
KIB-PRA (S222-0026) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 6, mandatory course
PIB-PRA (S221-0173) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 6, mandatory course
PIB-PRA (S221-0173) Applied Informatics, Bachelor, SO 01.10.2026 , semester 6, mandatory course

PRI-PRA (S223-0002) Production Informatics, Bachelor, SO 01.10.2023 , semester 6, mandatory course
PRI-PRA (S223-0002) Production Informatics, Bachelor, SO 01.10.2026 , semester 6, mandatory course

Workload:
The total student study time for this course is 450 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Studienleitung

Lecturer: Studienleitung

[*updated 07.08.2019*]

Learning outcomes:
After successfully completing this module, students will:
be able to apply the skills and knowledge acquired during their studies to project tasks in a company.
have learned to familiarize themselves with a new working environment.
have solved concrete, thematically focused problems in a company.
have gained actual practical insight into the role of computer scientists in a company.
be familiar with the organizational structure of a company.

[*updated 17.04.2025*]

Module content:
Together, the student, their university supervisor and the company where the internship is carried out will determine the topics to be worked on by the student during his or her internship. The work done during the internship should prepare students for the bachelor thesis to be written afterwards

Each student will write a report of approx. 8-10 DIN A4 pages about the work done during their internship and describe their practical experience.

In addition, they are required to give a short lecture on the contents of his practical phase.

[*updated 26.02.2018*]

Recommended or required reading:
Depends on the respective subject areas dealt with in practice.

[*updated 26.02.2018*]

Production Informatics Bachelor - optional courses

.NET Concepts and Tools

Module name (EN): .NET Concepts and Tools

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-NETW

Hours per semester week / Teaching method:
2V+2P (4 hours per week)

ECTS credits:
5

Semester: 4

Mandatory course: no

Language of instruction:
German

Assessment:
Project work

[*updated 26.02.2018*]

Applicability / Curricular relevance:

KI665 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014 , semester 6, optional course, technical
KIB-NETW (P221-0096) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 6, optional course, technical
KIB-NETW (P221-0096) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 6, optional course, technical
PIBWI79 Applied Informatics, Bachelor, ASPO 01.10.2011 , semester 6, optional course, informatics specific
PIB-NETW (P221-0096) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, optional course, informatics specific
PIB-NETW (P221-0096) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course, informatics specific
PRI-NETW Production Informatics, Bachelor, SO 01.10.2023 , semester 4, optional course, informatics specific
PRI-NETW Production Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Thomas Beckert, M.Sc.

Lecturer: Thomas Beckert, M.Sc.

[*updated 28.04.2025*]

Learning outcomes:
Based on the content management system Umbraco, students will acquire the ability to conceptually assess Microsoft´s .NET framework and use it for the development of web portals.

They will be able to model web applications with the ASP. NET MVC pattern.

Students will be capable of creating interactive elements with the inline script engine Razor (C#).
In doing so, they will learn to extend the CMS backend. Using the SQL Management Studio, students will be able to view and modify database-driven information.

[*updated 26.02.2018*]

Module content:
1. Installing CMS Umbraco
2. .NET framework
3. MVC approach and Umbraco basics of the backend
4. Media content
5. Partial view macros
6. Grid - flexible content creation
7. Property editor
8. Umbraco API, C# and Visual Studio
9. Extending the backend
10. Database communication with PetaPoco
11. Handlers and web services in .NET
12. Search function in Umbraco
13. Multilingualism
14. Surface controller
15. Members area
16. Web application, project work/practical exercises

[*updated 26.02.2018*]

Recommended or required reading:
Will be announced in the course

[*updated 26.02.2018*]

Cloud Computing

Module name (EN): Cloud Computing

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-CCOM

Hours per semester week / Teaching method:
2V+2PA (4 hours per week)

ECTS credits:
5

Semester: 4

Mandatory course: no

Language of instruction:
German

Assessment:

[*still undocumented*]

Applicability / Curricular relevance:

KI699 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014 , semester 6, optional course, technical
KIB-CCOM (P221-0066) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 6, optional course, technical
KIB-CCOM (P221-0066) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 6, optional course, technical
PIBWI18 Applied Informatics, Bachelor, ASPO 01.10.2011 , semester 6, optional course, informatics specific
PIB-CCOM (P221-0066, P221-0181) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, optional course, informatics specific
PIB-CCOM (P221-0066, P221-0181) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course, informatics specific
PRI-CCOM Production Informatics, Bachelor, SO 01.10.2023 , semester 4, optional course, informatics specific
PRI-CCOM Production Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Markus Esch

Lecturer: Prof. Dr. Markus Esch

[*updated 03.12.2024*]

Learning outcomes:
After successfully completing this module, students will be able to name the basic concepts and service models of cloud computing. They will be able to explain the technological foundations of cloud computing and describe modern architectures.

Students will be able to describe advantages and disadvantages, as well as differences to traditional server-based applications, especially in terms of scalability and availability, and will be able to recognize the relationship between architecture and scalability.

Within the framework of a project, students will learn how to work together in small groups and will be able to design and implement scalable cloud-based applications.

[*updated 24.02.2018*]

Module content:
1. Cloud computing architectures, concepts and technologies
   - IaaS, PaaS, SaaS
   - distributed key-value stores
   - distributed file systems
   - distributed hash tables
   - gossiping
   - load balancing
   - consistency
   - error tolerance
   - microservices
2. Cloud computing from a developer´s perspective
   - developing cloud-based applications
   - tools and procedures

[*updated 24.02.2018*]

Teaching methods/Media:
Lecture slides, annotated lecture slides as a script, program examples, project work

[*updated 24.02.2018*]

Recommended or required reading:
Christoph Fehling, Frank Leymann, Ralph Retter, Walter Schupeck, Peter Arbitter: Cloud Computing Patterns: Fundamentals to Design, Build, and Manage Cloud Applications, Springer, 2014

Kenneth P Birman: Guide to Reliable Distributed Systems: Building High-Assurance Applications and Cloud-Hosted Services, Springer, 2012

Thomas Erl: Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, 2013

Thomas Erl and Robert Cope: Cloud Computing Design Patterns, Prentice Hall, 2015

Irakli Nadareishvili, Ronnie Mitra, Matt McLarty, Mike Amundsen: Microservice Architecture: Aligning Principles, Practices, and Culture, O_Reilly, 2016

[*updated 24.02.2018*]

IT Forensics

Module name (EN): IT Forensics

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-ITF

Hours per semester week / Teaching method:
1V+1P (2 hours per week)

ECTS credits:
2

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:
Successful participation in the tutorial, oral examination

[*updated 26.02.2018*]

Applicability / Curricular relevance:

DFBI-344 (P610-0200) Computer Science and Web Engineering, Bachelor, ASPO 01.10.2018 , semester 6, optional course, informatics specific
KI690 (P221-0083) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014 , semester 5, optional course, technical
KIB-ITF Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 5, optional course, technical
KIB-ITF Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 5, optional course, technical
PIBWI54 (P221-0083) Applied Informatics, Bachelor, ASPO 01.10.2011 , semester 5, optional course, informatics specific
PIB-ITF Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 5, optional course, informatics specific
PIB-ITF Applied Informatics, Bachelor, SO 01.10.2026 , semester 5, optional course, informatics specific
PRI-ITF Production Informatics, Bachelor, SO 01.10.2023 , semester 5, optional course, informatics specific
PRI-ITF Production Informatics, Bachelor, SO 01.10.2026 , semester 5, optional course, informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Damian Weber

Lecturer: Prof. Dr. Damian Weber

[*updated 03.12.2024*]

Learning outcomes:
After successfully completing this course, students will be able to use the system properties of an IT system to secure evidence that can be used in court after an IT security incident. To this end, they will apply best practices, compare the advantages and disadvantages, isolate problems that arise and investigate the usability of the secured data. They will be capable of interpreting the collected data and presenting the results convincingly to an independent authority.

[*updated 26.02.2018*]

Module content:
1. General information about the field
   Tools
   Literature

2. Introduction
   Definition of terms
   Motivation for authorities
   Motivation for companies

3. Principles of IT forensics
   Procedure model
   Digital traces
   Volatile data
   Interpreting data
   Interpreting time stamps

4. File system basics
   Hard disks, partitioning, file systems
   Unix file management

5. File system analysis
   Creating a file system image
   Analyzing a file system image
   Deleted files
   File carving

6. Analyzing a compromised system
   Process handling
   RAM
   Rootkits

[*updated 26.02.2018*]

Recommended or required reading:
Forensic Discovery. (Addison-Wesley Professional Computing) (hard cover)
by Daniel Farmer (author), Wietse Venema (author)

http://www.amazon.de/Forensic-Discovery-Addison-Wesley-Professional-Computing/dp/020163497X

File System Forensic Analysis. (soft cover) by Brian Carrier (author)
http://www.amazon.de/System-Forensic-Analysis-Brian-Carrier/dp/0321268172

[*updated 26.02.2018*]

Kinematic Principles of Robotics

Module name (EN): Kinematic Principles of Robotics

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-KGR

Hours per semester week / Teaching method:
3V+1U (4 hours per week)

ECTS credits:
5

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:

[*updated 19.12.2023*]

Applicability / Curricular relevance:

BMT2505.KGR (P221-0197) Biomedical Engineering, Bachelor, ASPO 01.10.2018 , semester 5, optional course
BMT2505.KGR (P221-0197) Biomedical Engineering, Bachelor, SO 01.10.2025 , semester 5, optional course
E2588 (P221-0197) Electrical Engineering and Information Technology, Bachelor, ASPO 01.10.2018 , semester 5, optional course
KIB-KGR (P221-0197) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 5, optional course
MAB_19_4.2.1.39 (P221-0197) Mechanical and Process Engineering, Bachelor, ASPO 01.10.2019 , semester 5, optional course
MST2.KGR (P221-0197) Mechatronics and Sensor Technology, Bachelor, ASPO 01.10.2020 , semester 5, optional course
PIB-KGR (P221-0197) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 5, optional course
PIB-KGR (P221-0197) Applied Informatics, Bachelor, SO 01.10.2026 , semester 5, optional course
PRI-KGR Production Informatics, Bachelor, SO 01.10.2023 , semester 5, optional course

PRI-KGR Production Informatics, Bachelor, SO 01.10.2026 , semester 5, optional course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Michael Kleer

Lecturer: Prof. Dr. Michael Kleer

[*updated 03.12.2024*]

Learning outcomes:
Students will be able to demonstrate and apply the most important methods for describing and calculating robot systems. They will be able to independently explain and calculate the interaction of robot systems with several coordinate systems and the associated coordinate transformations in detail. In addition, students will be able to independently calculate the forward and inverse kinematics of typical industrial robots and solve path and trajectory planning tasks.

[*updated 19.12.2023*]

Module content:
1. Classifying robot workspaces
2. Principles of rotations, transformations, coordinate system representations
3. Introduction to homogeneous transformations
4. Introduction to the Denavit-Hartenberg transformation method
5. Forward and inverse kinematics of serial robots
6. Basics of the Jacobian matrix
7. The fundamentals of path and trajectory planning

[*updated 19.12.2023*]

Recommended or required reading:
Springer Handbook of Robotics, https://doi.org/10.1007/978-3-540-30301-5
Robot Modeling and Control, ISBN: 978-1-119-52404-5

[*updated 19.12.2023*]

Machine Learning

Module name (EN): Machine Learning

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-MLRN

Hours per semester week / Teaching method:
2V+2U (4 hours per week)

ECTS credits:
5

Semester: 6

Mandatory course: no

Language of instruction:
English

Assessment:
Written exam, Duration 90 min.

[*updated 13.10.2024*]

Applicability / Curricular relevance:

KI575 Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014 , semester 6, optional course, technical
KIB-MLRN (P221-0085) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 6, optional course, technical
KIB-MLRN (P221-0085) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 6, optional course, technical
PIBWI19 (P610-0536) Applied Informatics, Bachelor, ASPO 01.10.2011 , semester 6, optional course, informatics specific
PIB-MLRN (P221-0085) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 6, optional course, informatics specific
PIB-MLRN (P221-0085) Applied Informatics, Bachelor, SO 01.10.2026 , semester 6, optional course, informatics specific
PRI-MLRN Production Informatics, Bachelor, SO 01.10.2023 , semester 6, optional course, informatics specific
PRI-MLRN Production Informatics, Bachelor, SO 01.10.2026 , semester 6, optional course, informatics specific

Suitable for exchange students (learning agreement)

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Klaus Berberich

Lecturer: Prof. Dr. Klaus Berberich

[*updated 03.12.2024*]

Learning outcomes:
After successfully completing this module, students will know about fundamental supervised and unsupervised methods from machine learning. This includes methods for regression, classification (e.g., logistic regression and decision trees), and clustering. Students will understand how these methods work and know how to use existing implementations (e.g., in libraries such as scikit-learn). Given a practical problem setting, they will be able to choose a suitable method, apply it to the dataset at hand, and assess the quality of the determined model. In addition, students will be aware of typical data-quality issues and know how to resolve them.

[*updated 13.10.2024*]

Module content:
Machine learning plays an increasingly important role with applications ranging from recognizing handwritten digits, via filtering out unwanted span e-mails, to the ranking of results in modern search engines. After successfully completing this module, students will know about fundamental supervised and unsupervised methods of machine learning. We will look into how these methods are defined formally, including the mathematics behind them. Moreover, we will apply all methods on concrete datasets to solve practical problems. To do so, we will rely on existing libraries (e.g., scikit-learn) that provide efficient implementations of the methods. This course will be accompanied by theoretical exercises and project assignments. The exercises will help students to deepen their understanding of the methods, while the project assignments will encourage students to solve practical problems by applying their knowledge to real-world datasets.

1. Introduction
- What is Machine Learning?
- Applications
- Libraries
- Literature

2. Working with data
- Typical data formats (e.g., CSV, spreadsheets, databases)
- Data quality issues (e.g., outliers, duplicates)
- Scales of measures (i.e., nominal, ordinal, numerical)
- Data pre-processing (in Python and using UNIX command line tools)

3. Regression
- Ordinary least squares
- Multiple linear regression
- Non-linear regression
- Evaluation

4. Classification
- Logistic regression
- k-nearest neighbors
- Naive Bayes
- Decision trees
- Neural networks
- Evaluation

5. Clustering
- k-means

- Hierarchical agglomerative/divisive clustering
- Density-based clustering
- Evaluation

6. Outlook
- Ongoing research
- Competitions (e.g., Kaggle and KDD Cup)
- Other resources (e.g., KDnuggets)

[*updated 13.10.2024*]

Recommended or required reading:
A. Burkov: The Hundred-Page Machine Learning Book,
self published, 2019
http://themlbook.com

G. James, D. Witten, T. Hastie, R. Tibshirani, Jonathan Taylor: An Introduction to Statistical Learning - with Applications in Python,
Springer 2023

S. Raschka and V. Mirjalili: Python Machine Learning,
Packt Publishing, 2019

M. J. Zaki und W. Meira Jr.: Data Mining and Analysis: Fundamental Concepts and Algorithms,
Cambridge University Press, 2020

[*updated 13.10.2024*]

Mentoring

Module name (EN): Mentoring

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-MENT

Hours per semester week / Teaching method:
2S (2 hours per week)

ECTS credits:
2

Semester: 5

Mandatory course: no

Language of instruction:
German

Assessment:
Seminar paper

[*updated 19.02.2018*]

Applicability / Curricular relevance:

BMT2590.MEN (P200-0018) Biomedical Engineering, Bachelor, ASPO 01.10.2018 , semester 5, optional course
BMT2590.MEN (P200-0018) Biomedical Engineering, Bachelor, SO 01.10.2025 , semester 5, optional course
KI591 (P200-0018) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2014 , semester 5, optional course, non-technical
KIB-MENT (P200-0018) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2021 , semester 5, optional course, non-technical
KIB-MENT (P200-0018) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 5, optional course, non-technical
MAB.4.2.1.15 (P200-0018) Mechanical and Process Engineering, Bachelor, ASPO 01.10.2013 , semester 3, optional course
PIBWN39 Applied Informatics, Bachelor, ASPO 01.10.2011 , semester 5, optional course, not informatics specific
PIB-MENT (P200-0018) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 5, optional course, not informatics specific
PIB-MENT (P200-0018) Applied Informatics, Bachelor, SO 01.10.2026 , semester 5, optional course, not informatics specific
PRI-MENT (P200-0018) Production Informatics, Bachelor, SO 01.10.2023 , semester 5, optional course, not informatics specific
PRI-MENT (P200-0018) Production Informatics, Bachelor, SO 01.10.2026 , semester 5, optional course, not informatics specific

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 37.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Sandra Wiegand, M.A.

Lecturer: Sandra Wiegand, M.A.

[*updated 03.12.2024*]

Learning outcomes:
After successfully completing this module, the students will have acquired the following competences:
- They will know, understand and be able to explain the structure of mentoring programs
- They will know and understand theories of conversation techniques and be able to apply them during consultations
- They will be able to plan and conduct consultations and group discussions
- They will be able to reflect upon and optimize their consulting competences
- They will be able to build new networks

(Text form: In addition to teaching the history, structure and background of mentoring programs in general,

this course is intended help students become familiar with the university´s internal mentoring program. Students will get to know different theories of conversation and practice using them. By means of different methods, students will learn to reflect upon and optimize their own consulting skills. For the duration of one semester, students will support a group of 6-10 other students via group work and individual counselling. Through regular inter-faculty meetings, students will establish new networks.

[*updated 19.02.2018*]

Module content:
- Definition, history and background of mentoring programs in the USA and Europe
- Structure and course of the HTW mentoring program
- Theories in conversation management
- Theories about group dynamics
- Non-verbal communication
- Schulz von Thun communication model
- Constructive criticism
- Giving feedback
- Active listening
- Assuming roles
- Planning, structuring and recording consultations and group discussions

[*updated 19.02.2018*]

Teaching methods/Media:
Worksheets and guidelines for the course and presentations, slide handouts, work in small groups, role playing

[*updated 26.02.2018*]

Recommended or required reading:
Deutsches Jugendinstitut e.V. (Hrsg.) (1999): Mentoring für Frauen. Eine Evaluation verschiedener Mentoring Programme. München.

Haasen, Nele (2001): Mentoring. Persönliche Karriereförderung als Erfolgskonzept. München.

Heinze Christine (2002): Frauen auf Erfolgskurs. So kommen Sie weiter mit Mentoring. Freiburg.

Krell, Gertraude (Hrsg.) (1997): Chancengleichheit durch Personalpolitik,Wiesbaden

[*updated 19.02.2018*]

Programming 4

Module name (EN): Programming 4

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-PRG4

Hours per semester week / Teaching method:

3V+1P (4 hours per week)

ECTS credits:
5

Semester: 4

Mandatory course: no

Language of instruction:
German

Assessment:
Exam

[*updated 14.05.2025*]

Applicability / Curricular relevance:

PIBWI50 Applied Informatics, Bachelor, ASPO 01.10.2011 , semester 5, optional course, informatics specific
PIB-PRG4 (P221-0123) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, optional course, informatics specific
PIB-PRG4 (P221-0123) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course, informatics specific
PRI-PRG4 Production Informatics, Bachelor, SO 01.10.2023 , semester 4, optional course, informatics specific
PRI-PRG4 Production Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Martin Burger

Lecturer: Prof. Dr.-Ing. Martin Burger

[*updated 06.05.2025*]

Learning outcomes:
After successfully completing this module, students will:
be proficient in the basic language concepts (data types, expressions, control structures, functions, exception handling) of C++.
be proficient in the special C++ concepts of object orientation (classes, objects, inheritance, polymorphism) and be able to implement them in programming terms.

be capable of using function and class templates in programs.
be able handle basic classes and algorithms of the C++ standard library (e. g. strings, input/output, container classes, generic algorithms) confidently.
be able to develop solutions to difficult problems in small teams and implement them in a well-structured manner.

[*updated 14.05.2025*]

Module content:
The course will introduce students to structured, object-oriented and generic programming with C/C++. C/C++ language elements will be introduced and their use practiced in exercises on the basis of the knowledge imparted in the Programming 1-3 modules. The use of the C/C++ standard library will be emphasized.

1. Introduction
   - History
   - Use
   - Development of C/C++ programs
   - A comparison of C++ and Java
2. The basics
   2.1 The basics and data types
   2.2 Arithmetic
   2.3 Type transformations
   2.4 Control structures
3. Functions and structures
   3.1 Functions and references
   3.2 Structures
   3.3 Preprocessor directives
4. Data types
   4.1 Enums and arrays
   4.2 C strings
   4.3 The string class
   4.4 Pointers
5. In/Output
   5.1 In/Output
   5.2 Input/Output formatting
   5.3 File handling
6. Classes
   6.1 Structure of classes
   6.2 Using Doxygen
   6.3 Copy constructor and assignment operator
   6.4 Class attributes and methods
   6.5 Friends
7. Overloading operators
   7.1 Overloadable operators
   7.2 A rational number class
   7.3 Various applications
   7.4 Smart pointer
8. Inheritance
   8.1 Introduction
   8.2 Virtual functions
   8.3 Copy constructor and assignment operator
   8.4 Abstract classes
   8.5 Multi inheritance

8.6 The dynamic_cast operator
9. Exception handling
10. Templates
10.1 Function templates
10.2 Class templates
11. Standard template library
11.1 Introduction
11.2 Sequence containers
11.3 Iterators and algorithms
11.4 Associative containers
12. Runtime Type Information (RTTI)

[*updated 14.05.2025*]

Teaching methods/Media:
Transparencies, projector, lecture-specific homepage

[*updated 24.02.2018*]

Recommended or required reading:
Breymann, Ulrich: Der C++ Programmierer. C++ lernen - Professionell anwenden - Lösungen nutzen., Hanser-Verlag
Stroustrup, Bjarne: Einführung in die Programmierung mit C++, Pearson Studium
Eckel, Bruce: Thinking in C++; Second Edition; Prentice Hall: www.bruceeckel.com
Grimm, Rainer: C++11: Der Leitfaden für Programmierer zum neuen Standard Addison-Wesley
Will, Torsten T.: C++11 programmieren: 60 Techniken für guten C++11-Code Galileo Computing;
Meyers, Scott: Effektiv C++ programmieren: 55 Möglichkeiten, Ihre Programme und Entwürfe zu verbessern; Addison-Wesley
Schäling, Boris: The Boost C++ Libraries; Xml Press
Bjarne Stroustrup"s C++ Style and Technique FAQ: http://www.stroustrup.com/bs_faq2.html
The C++ Resources Network: http://www.cplusplus.com/
C++ Reference: http://www.cppreference.com
Boost-Library: http://www.boost.org/

[*updated 14.05.2025*]

User Experience Engineering

Module name (EN): User Experience Engineering

Degree programme: Production Informatics, Bachelor, SO 01.10.2026

Module code: PRI-UXE

Hours per semester week / Teaching method:
2V+2U (4 hours per week)

ECTS credits:
5

Semester: 4

Mandatory course: no

Language of instruction:
German

Assessment:
Project with presentation

[*updated 30.06.2024*]

Applicability / Curricular relevance:

KIB-UXE (P221-0204) Computer Science and Communication Systems, Bachelor, ASPO 01.10.2022 , semester 4, optional course, technical
PIB-UXE (P221-0204) Applied Informatics, Bachelor, ASPO 01.10.2022 , semester 4, optional course, informatics specific
PIB-UXE (P221-0204) Applied Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course, informatics specific
PRI-UXE Production Informatics, Bachelor, SO 01.10.2023 , semester 4, optional course
PRI-UXE Production Informatics, Bachelor, SO 01.10.2026 , semester 4, optional course

Suitable for exchange students (learning agreement)

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Maximilian Altmeyer

Lecturer: Prof. Dr. Maximilian Altmeyer

[*updated 03.12.2024*]

Learning outcomes:
After successfully completing this module students will: be able to describe the basic principles of user experience, differentiate these from related concepts such as usability and explain the user-centered design process. They will be able to explain basic concepts in the field of user research and use them to understand users and the application context and derive user needs. They will have a command of common ideation processes and be able to critically scrutinize ideas with regard to the underlying user needs. The will be able to develop concepts and MVP statements on the basis of user research. They will be familiar with various approaches in the field of UX (especially gamification) and can explain how and why these can enhance the user experience and what dangers need to be considered (dark patterns). They will be able to explain and apply basic concepts of prototyping and discuss the advantages and disadvantages. They will also be able to develop concepts for evaluating interactive systems with regard to their user experience and describe and apply basic qualitative and quantitative empirical methods.

[*updated 28.02.2024*]

Module content:
- User experience, usability, user-centered design process
- Understanding the user and the context of use
- User needs, problem statements, personas, scenarios
- Ideation: Brainstorming, challenge assumptions, design concepts
- Gamification, dark patterns, behavior change and ethical aspects
- MVP statements, business goals
- Prototyping: Low vs. high fidelity prototypes, paper prototypes,
- User testing: Qualitative and quantitative measures of UX

In addition to the lecture, UX methods learned in the exercise will be applied in a kind of workshop. Over the course of the semester, students will work in groups to identify problems through user research (e.g. by interviewing other students on campus), generate ideas, build a minimal prototype and test/evaluate it.

[*updated 28.02.2024*]

Teaching methods/Media:
Workshops, Design Thinking

[*updated 28.02.2024*]

Recommended or required reading:

[*updated 28.02.2024*]