Course Handbook Industrial Engineering / Production Management Bachelor

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Head of Studies	Prof. Dr. Andreas Metz
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Chairman of Examination	Prof. Dr. Andreas Metz
Deputy Chairman of Examination	Prof. Dr.-Ing. Jan Christoph Gaukler

Industrial Engineering / Production Management Bachelor - mandatory courses (overview)

Module name (EN)	Code	SAP-P	Academic Year	Clock hours	ECTS	Module coordinator
Applied Computer Science and Industry 4.0	DBWI-310	P740-0028, P740-0029	3	-	7	Prof. Dr.-Ing. Jürgen Kohlrusch
Electrical Engineering	DBWI-230	P740-0020	2	-	6	Prof. Dr.-Ing. Jan Christoph Gaukler
External Accounting & Taxes	DBWI-260	P740-0023	2	-	6	Prof. Dr. Jörg Henkes
Industrial Management	DBWI-250	P740-0022	2	-	7	Prof. Dr. Andreas Metz
Legal Principles and Economics	DBWI-370	P740-0037	3	-	6	Prof. Dr. Andreas Metz
Management & Controlling	DBWI-340	P740-0034	3	-	5	Prof. Dr. Andreas Metz
Management Accounting	DBWI-360	P740-0036	3	-	5	Prof. Dr. Thomas Kunz
Manufacturing and Materials Technology	DBWI-240	P740-0021	2	-	5	Prof. Dr.-Ing. Jan Christoph Gaukler

Module name (EN)	Code	SAP-P	Academic Year	Clock hours	ECTS	Module coordinator
Marketing and Sales	DBWI-350	P740-0035	3	-	5	Prof. Dr.-Ing. Jürgen Kohlrusch
Mathematics for Industrial Engineers 3	DBWI-210	P740-0018	2	-	5	Prof. Dr.-Ing. Jan Christoph Gaukler
Practical Training Module 1	DBWI-190	P740-0016	1	-	13	Prof. Dr. Andreas Metz
Practical Training Module 2	DBWI-380	P740-0038	3	-	6	Prof. Dr. Andreas Metz
Practice-Oriented Project	DBWI-270	P740-0024, P740-0025	2	-	12	Prof. Dr. Andreas Metz
Scientific Basics	DBWI-130	P740-0005, P740-0006, P740-0007	1	48UV+32UU+16UP	5	Prof. Dr.-Ing. Jan Christoph Gaukler
Work, Human Resources and Leadership	DBWI-330	P740-0039	3	-	5	Prof. Dr. Andreas Metz

(15 modules)

Industrial Engineering / Production Management Bachelor - optional courses (overview)

Module name (EN)	Code	SAP-P	Academic Year	Clock hours	ECTS	Module coordinator

(0 modules)

Industrial Engineering / Production Management Bachelor - mandatory courses

Applied Computer Science and Industry 4.0

Module name (EN): Applied Computer Science and Industry 4.0

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-310

Hours per semester week / Teaching method:
-

ECTS credits:
7

Academic Year: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
2 graded exams:

- Exam 1 (Applied Computer Science: Duration 90 min., 100 pts.)
  This exam is written in the 5th semester (Block 5A) according to the exam schedule.

- Exam 2 (Industry 4.0: Duration 90 min., 100 pts.)
  This exam is written in the 6th semester (Block 6A) according to the exam schedule.

The reason for dividing the examination into two parts, one of which is written in Block 5A (5th semester) and the other in Block 6A (6th semester), is to distribute the workload evenly.

The module grade is calculated as follows:
43% of the points in Exam 1 Applied Computer Science
57% of the points in Exam 2 Industry 4.0

[*updated 08.05.2023*]

Applicability / Curricular relevance:

DBWI-310 (P740-0028, P740-0029) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course
DBWI-310 (P740-0028, P740-0029) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 3, mandatory course

Workload:
The total student study time for this course is 210 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jürgen Kohlrusch

Lecturer: Prof. Dr.-Ing. Jürgen Kohlrusch

[*updated 11.06.2021*]

Learning outcomes:
Applied Computer Science:
Basic concepts of computer science will be taught and applied to simple problems. Students therefore receive an introduction to programming in this module. After successfully completing this module, they will understand the term "algorithm" and be familiar, for example, with algorithms for searching and sorting data. They will be familiar with different data structures. They will be able to implement algorithms for simple problems. Students will be aware of the increasing importance of computer science for engineering disciplines.

Industry 4.0:
In the future, the influence of digitalization will cause profound changes in the world of work in industry and commerce. In the "Industry 4.0" sub-module, students will become familiar with the factors that influence future processes in industry and what challenges they may face. Students will be able to identify and describe the differences between business processes that are already automated today and a fully networked "smart factory" as envisaged by Industry 4.0 in the future. They will be familiar with so-called cyber-physical systems and understand how structured, semi-structured and unstructured data can be processed in large quantities ("Big Data"). They are familiar with the basics of artificial intelligence and can recognize its practical potential in future business areas.

The "Applied Computer Science and Industry 4.0" module will increase and strengthen students professional competence.

[*updated 08.05.2023*]

Module content:
Content: Applied Computer Science:
Algorithm: Definition and meaning
Data structures
Introduction to programming
Application to, for example, search procedures, as well as to simple and higher sorting procedures

Content: Industry 4.0:
Introduction to Industry 4.0
- o Smart home, smart car, smart factory - Applications
- o Humans in the digitalized environment - Augmented, virtual and mixed reality
- o Production data acquisition (PDA) and machine data acquisition (MDC)
- o Legal challenges

Cyber-physical systems
- o RFID, GPS
- o Network technology, server clusters
- o Data security, backup and data protection
- o Robotics and human/machine collaboration

Big Data and Artificial Intelligence (AI)

o Structured, semi-structured and unstructured data
o Volume, Variety, Velocity, the "V´s" of Big Data
o Introduction to Hadoop, HDFS and Mapreduce
o How artificial neural networks and fuzzy logic work
o Swarm intelligence
o Big Data and AI in practice

[*updated 08.05.2023*]

Recommended or required reading:
R. Sedgewick, K. Wayne (2014): Algorithmen und Datenstrukturen (4. Auflage); Pearson, Hallbergmoos
J. Bewersdorff (2018): Objektorientierte Programmierung mit JavaScript; Springer Vieweg, Wiesbaden
A. Bauer, H. Günzel (Hrsg.): Data-Warehouse-System Architektur, Entwicklung, Anwendung; dpunkt Verlag; Heidelberg
P. Chamoni, P. Gluchowski (Hrsg.): Analytische Informationssysteme Business Intelligence-Technologien und -Anwendungen; Springer Verlag; Berlin/Heidelberg
J. Freiknecht: Big Data in der Praxis Lösungen mit Hadoop, HBase und Hive. Daten speichern, aufbereiten, visualisieren; Carl Hanser; München
Th. Schulz: Industrie 4.0: Potenziale erkennen und umsetzen, Vogel Business Media
R. M. Wagner: Industrie 4.0 für die Praxis, Springer Gabler

[*updated 08.05.2023*]

Electrical Engineering

Module name (EN): Electrical Engineering

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-230

Hours per semester week / Teaching method:
-

ECTS credits:
6

Academic Year: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Duration 150 min., 100 pts.)
The exam will be written in the 4th semester (Block 4A) in accordance with the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2022).
The exam will be written in the 6th semester (Block 6A) in accordance with the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2022).

Distribution:
- 70 pts. (105 min) on "Fundamentals of Electrical Engineering" and the associated laboratory exercises

- 30 pts. (45 min) on "Electric Drive Systems" and the corresponding laboratory exercises

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-230 (P740-0020) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 3, mandatory course
DBWI-230 (P740-0020) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 2, mandatory course

Workload:
The total student study time for this course is 180 hours.

Recommended prerequisites (modules):
DBWI-110
DBWI-120
DBWI-130 Scientific Basics

[*updated 31.01.2023*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jan Christoph Gaukler

Lecturer: Prof. Dr.-Ing. Jan Christoph Gaukler

[*updated 11.06.2021*]

Learning outcomes:
After successfully completing this module, students will be familiar with the basic laws and physical relationships of electrical engineering and have mastered their application in mechanical engineering and production technology. They will be able to classify and evaluate the analogies between mechanics and electrical engineering as well as the economic significance of electrical engineering in a superordinate context. Students will be able to design, draw and calculate simple electrotechnical circuits independently and choose between electrotechnical and mechanical solutions according to technical and economic aspects, or to complement solutions from both areas in a meaningful way. They will be familiar with the principles and methods for measuring electrical and non-electrical quantities and will be able to apply them. Students will be able to understand basic correlations in electrical engineering processes and select and apply adequate problem solving methods.

They will be able to name electrical machines and their components and analyze the operating behavior of electrical machines based on given data in order to calculate selected variables and characteristic curves. In doing so, they will use the usual equivalent circuit diagrams and graphical methods.

They will have a good command of the terms, symbols and language used in electrical engineering in order

to be able to communicate in an interdisciplinary team with electrical engineers, among others.

[*updated 08.04.2025*]

Module content:
Fundamentals of Electrical Engineering:

Electric field with quantities and methods:
Charge, current, current density, potential, voltage, field strength, force on charge carriers, Ohm´s law, resistance, conductance, electrical circuit, source voltage, voltage drop, power, electrical displacement flux, capacitance, EMC

Magnetic field with quantities and methods:
magnetic poles, source-free field, right-hand rule, magnetic flux, magnetic induction, magnetic flux density, magnetic tension, magnetic resistance, permeability, magnetic field constant, hysteresis, Lorentz force, law of induction, generator, self-induction, mutual induction, inductance, transformer, eddy currents, energies and forces in magnetic field, passive components

Calculating circuits with direct current:
Kirchhoff´s laws, basic circuit, short circuit, open circuit, matching, energy and power, efficiency, non-linear resistances, graphical determination of the operating point, resistance networks, intermeshed networks, systematic network analysis using the node-mesh method

Calculation of circuits with alternating current:
Generating alternating voltage with an electric motor, time average, effective value, counting arrows, voltage and current at capacitance and inductance, series circuits for alternating current, vector diagrams, parallel circuits for AC, complex phasors in AC, complex representation of resistors and conductances in AC, active power, reactive power, apparent power, series and parallel resonant circuits, power factor correction

Three-phase alternating current:
Three-phase alternating current: interlinked three-phase system, power in three-phase system, star-delta switching, neutral conductor currents, frequent cases of unbalanced errors

Electric drive systems:

Torque generation, electrical and mechanical power, rotating field generation and torque generation in three-phase machines

DC machines:
Design, operating principle, armature reaction, equivalent circuit, characteristic curve, generator and motor operation, speed control, special designs, speed control

Three-phase asynchronous machine (TAM):
Design, operating principle, equivalent circuit, pointer diagrams, characteristic curve, current locus diagram, current-replacing rotor, DASM on the frequency inverter

Synchronous machine:
Design, rotor types, excitation systems, equivalent circuits, pointer images, characteristic curves, current locus diagrams

DC and three-phase motors on single-phase alternating current

Electrical engineering laboratory:

The Elektrotechnisches Labor (Electrical Engineering Laboratory) component provides practical training and enables the application of the knowledge acquired in the lectures by means of the following tests/exercises/experiments: Unloaded and loaded voltage divider, bridge circuit using the deflection method, filter circuit (RC low-pass filter), series resonant circuit, symmetrical and asymmetrical loading of a three-phase system (star circuit), three-phase asynchronous machine controlled by means of a frequency converter, recording a characteristic curve on a slip ring motor, fan control (bridge circuit with temperature-dependent resistor, threshold switch and transistor switch).

[*updated 08.04.2025*]

Teaching methods/Media:
Lecture: Lecture, demonstration, group work on concrete problems
Labs: Learning and experiencing scientific and technical interrelationships by means of experiments carried out in groups

[*updated 08.04.2025*]

Recommended or required reading:
R. Busch: Elektrotechnik für Maschinenbauer und Verfahrenstechniker, Teubner Verlag
R. Fischer, H. Linse: Elektrotechnik für Maschinenbauer, Teubner Verlag
E. Hering, R. Martin, J. Gutekunst, J. Kempkes: Elektrotechnik und Elektronik für Maschinenbauer, Springer Verlag
G. Flegel, K. Birnstiel, W. Nerreter: Elektrotechnik für Maschinenbau und Mechatronik, Hanser-Verlag.
G. Hagmann: Grundlagen der Elektrotechnik, Aula Verlag.

[*updated 08.04.2025*]

External Accounting & Taxes

Module name (EN): External Accounting & Taxes

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-260

Hours per semester week / Teaching method:
-

ECTS credits:
6

Academic Year: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Duration 120 min., 100 pts.)
The exam will be written in the 4th semester (Block 4A) according to the examination schedule (Wirtschaftsingenieurwesen, Bachelor, ASPO October 1, 2021).
The exam will be written in the 6th semester (Block 6A) according to the examination schedule (Wirtschaftsingenieurwesen, Bachelor, ASPO October 1, 2022).

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-260 (P740-0023) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 3, mandatory course
DBWI-260 (P740-0023) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 2, mandatory course

Workload:
The total student study time for this course is 180 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Jörg Henkes

Lecturer: Prof. Dr. Jörg Henkes

[*updated 11.06.2021*]

Learning outcomes:
The students will be familiar with the business accounting variables and be able to differentiate between them.

Students will have mastered the system of double-entry bookkeeping techniques. They will be able to post business transactions related to current business operations and to post a complete case from the opening balance sheet to the closing balance sheet. Students will be able to understand the interaction between the closing accounts and the calculations of the annual financial statements. They will be able to create a balance sheet and a profit and loss statement from the closing balance sheet and profit and loss account in accordance with legal requirements, and to use this as a basis to indirectly determine the operating cash flow.

Students will gain an overview of the legal requirements for the accounting and valuation of assets and liabilities. They will be familiar with the links between the commercial and the tax balance sheet. Students

will be proficient in adjusting the net profit for the year in the commercial balance sheet to the taxable income for corporation income tax and trade income. They will be able to make simple balance sheet and off-balance sheet adjustments and additions and will have an overview of the effects on the commercial balance sheet in the form of the tax provisions to be calculated. Students will have gained an overview of the net all-phase value-added tax (VAT) system practiced in Germany, including input tax deduction. They will be familiar with the regulations regarding the taxability and tax liability of services, also in international goods traffic. They will also be familiar with the requirements for input tax deduction and will be able to carry out standard postings with VAT and input tax accounts.

[*updated 08.04.2025*]

Module content:

Introduction
o Key provisions on external accounting
o Audit and disclosure requirements

Inventory, stocktaking and balance sheet
o Terms and definitions
o Balance sheet adjustments due to business transactions
o Effect of transactions on profit or loss

Accounting techniques
o Account, posting, posting record
o Opening and closing balances
o Profit and loss accounts
o Contributions and withdrawals in sole proprietorships and partnerships

VAT
o Basics
o Value Added Tax Posting
o VAT system
o Deposits/withdrawals and value added tax

Corporate income taxation: From the commercial balance sheet to taxable income and business income
o Corporate tax
o Trade tax
Connection between the commercial and tax balance sheets and the determination of the taxable income/trade income of a corporation

Accounting and valuation
o Eligibility for recognition in the financial statements
o Valuation in fixed and current assets: Procurement and manufacturing costs, distinction between maintenance and expansion, scheduled depreciation, unscheduled depreciation of fixed assets, write-ups of fixed assets, unscheduled depreciation and write-ups of current assets.
o Typical postings in the current assets of trading, industrial and service companies: Revenue, cost of goods sold (COGS) and materials used, valuation simplification methods, and inventory valuation methods (FIFO/LIFO)
o Accrued income and prepaid expenses
o Accounting and valuation of liabilities
o Provisions: categories, valuation of provisions in the commercial and tax balance sheets

Generally accepted accounting principles and principles of proper accounting

Cash flow statement

Financial report

Financial statement policy and analysis

[*updated 08.04.2025*]

Teaching methods/Media:
Lectures: Lecture, demonstrations, question and impulse teaching, working on concrete problems in groups

[*updated 08.04.2025*]

Recommended or required reading:
H. Bieg, H. Kußmaul: Externes Rechnungswesen; München; Oldenbourg
U. Döring, R. Buchholz: Buchhaltung und Jahresabschluss. Mit Aufgaben und Lösungen; Ber-lin; Erich Schmidt Verlag
G. Wöhe, H. Kußmaul, Heinz: Grundzüge der Buchführung und Bilanztechnik. Nach neuem HGB; München; Vahlen
M. Bornhofen: Steuerlehre I; Wiesbaden; Gabler
M. Bornhofen: Steuerlehre II; Wiesbaden; Gabler
H. Kußmaul: Betriebswirtschaftliche Steuerlehre; München; Oldenbourg

[*updated 08.04.2025*]

Industrial Management

Module name (EN): Industrial Management

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-250

Hours per semester week / Teaching method:
-

ECTS credits:
7

Academic Year: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Industrial Management 1 & 2 , duration 150 min., 100 pts.)
The exam will be written in the 3rd semester (Block 3B) according to the examination schedule.

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-250 (P740-0022) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course
DBWI-250 (P740-0022) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 2, mandatory course

Workload:
The total student study time for this course is 210 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
DBWI-320

[*updated 31.01.2023*]

Module coordinator:
Prof. Dr. Andreas Metz

Lecturer: Prof. Dr. Andreas Metz

[*updated 11.06.2021*]

Learning outcomes:

After successfully completing this module, students will be familiar with the fundamental characteristics of industrial companies and be able to describe and design the most important processes in a manufacturing company. They will be proficient in the fundamental methods of site and organizational planning. They can identify the most important production factors and associated planning problems. They will be able to apply established methods and processes for planning and managing industrial personnel, operating resources and materials, and will be familiar with the fundamentals of production and cost theory. They will be familiar with the production planning and control process in an industrial company. They can identify the planning and application areas, the planning principles and the planning steps involved in the systems and can critically assess the respective system. Students will be familiar with the goals and tasks of procurement. They will be familiar with the tasks involved in strategic and operational purchasing, will be aware of the various organizational forms of purchasing and procurement concepts, and will be able to design procurement structures accordingly. They will be familiar with the platforms, tools and standards of e-procurement. They will also be familiar with the flow of materials, goods and information in the incoming goods area and will be able to design the incoming goods process accordingly. They will be able to manage suppliers and supplier relationships. They will be familiar with the objectives of supplier management, be able to analyze supplier structures and develop standard strategies. They will understand the process of supplier management and its operational phases, from supplier scouting to supplier integration. In the area of

traditional materials management, students will be familiar with the statistical methods commonly used. They will be able to distinguish between materials and goods using ABC, XYZ, GMK and LMN analyses. In the industrial sector, students will be able to carry out program- or consumption-based material planning using various methods (unit cost method, cost equalization method, time series analyses, statistical forecasting methods) and will be proficient in methods for optimizing order quantities/batch sizes.

The Industrial Management module serves to expand and strengthen professional knowledge and understanding (broadening of knowledge) and instrumental skills. Together with the scientific and technical modules of the program, students will acquire the systemic skills to consider simple, interdisciplinary problems and tasks at the interface between production technology and business administration in a holistic way, and to independently design further learning processes.

[*updated 08.04.2025*]

Module content:

Introduction: Basic concepts, significance of production in Germany, typologies of industrial production systems, production-related economic goals

Location: utility analysis, break-even analysis

Production organization: structure and process organization, types of organization

Production factors: work, operating resources, materials, products

Production and cost theory: Basics, production function, cost function, diminishing returns as a type A production function, cost function based on diminishing returns, advanced production functions

Work scheduling information structure, basic data, objectives and tasks of production planning, contents of a work schedule, procedure for creating a work schedule

Production planning and control (PPC): development and planning areas of PPC systems

Procurement management: Basics, objectives and tasks of procurement and purchasing, strategic/operational purchasing, organizational forms of purchasing, procurement concepts, e-procurement, incoming goods

Strategic supplier management: tasks and objectives of strategic supplier management, analysis of the supplier structure, derivation of standard strategies

Operatives Supplier management: supplier scouting, evaluation, classification, selection, development and integration

Materials management: subject matter, forms of materials planning, materials classification as a basis for selecting the procedure (ABC/XYZ/LMN/GMK analysis), materials planning (program-related/consumption-related

[*updated 08.04.2025*]

Teaching methods/Media:

Lectures: Lecture (presenting), demonstration (presenting), question-and-answer teaching (developing), discussion-based teaching (developing), especially for a holistic approach to a problem from a scientific-technical, business-management and ethical, social and ecological perspective, working on specific problems in groups (developing)

[*updated 08.04.2025*]

Recommended or required reading:

H.-O. Günther, H. Tempelmeier: Produktion und Logistik, Berlin (u.a.), Springer

Th. Nebl: Produktionswirtschaft, München (u.a.), Oldenbourg

H. Corsten, R. Gössinger: Produktionswirtschaft, Einführung in das industrielle Produktionsmanagement, München, Oldenbourg

B. Ebel: Produktionswirtschaft, Ludwigshafen, Kiehl

Th. Nebl, A.-K. Schröder: Übungsaufgaben zur Produktionswirtschaft, München, Oldenbourg

[*updated 08.04.2025*]

Legal Principles and Economics

Module name (EN): Legal Principles and Economics

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-370

Hours per semester week / Teaching method:
-

ECTS credits:
6

Academic Year: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Duration 180 min., 100 pts.)
The exam will be written in the 6th semester (Block 6A) according to the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2021).
The exam will be written in the 4th semester (Block 4A) according to the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2022).

Distribution:
- 67 pts. (120 min) on Legal Basics
- 33 pts. (60 min) on Economics

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-370 (P740-0037) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course
DBWI-370 (P740-0037) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 3, mandatory course

Workload:
The total student study time for this course is 180 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Andreas Metz

Lecturer: Prof. Dr. Andreas Metz

[*updated 11.06.2021*]

Learning outcomes:

After successfully completing this module students will, students will be familiar with the principles of civil, labor, commercial, consumer protection and internet law, understand simple legal contexts and be able to solve simple legal problems independently. Furthermore, they will be able to recognize whether a legal issue can be resolved independently within the scope of their acquired skills or whether the help of an internal or external legal expert is required.

Students will be familiar with the principles of economic activity and economic interrelationships and will be able to assess their impact on their own business. They will understand how markets work, know the characteristics of the main market forms and the interplay between price, supply and demand. They will also be familiar with the most important aspects of national accounting and economic, business cycle and monetary policy.

The module Legal Principles and Economics serves to expand and strengthen professional knowledge and understanding (broadening of knowledge) and instrumental skills. Together with the degree program s scientific-technical and the business administration modules, students will achieve the competence to consider and solve larger interdisciplinary problems and tasks of medium complexity holistically, and to independently design further learning processes.

[*updated 08.04.2025*]

Module content:

Legal Basics
Civil law
o General principles
o Law of obligations
- Consumer protection: the shaping of legal obligations through general terms and conditions, consumer contracts, product liability law
- Internet law: contracts for Internet use, liability of service providers, contracts via the Internet, cybermoney, data protection
- Property law
Labor law: employment relationship (justification, defects, rights, obligations) and its termination (facts, protection against dismissal)
Commerical law: commercial status, commercial powers of attorney, commercial transactions

Economics
Microeconomics steering the economic process through market prices: theory of supply and demand, elasticities, markets and market forms, market equilibrium and pricing, market imbalances and market regulation, market failure.

Macroeconomics national accounts: circular flow of income, national income and its types of calculation, economic cycles
Economic, business cycle and monetary policy

[*updated 08.04.2025*]

Teaching methods/Media:
Lectures: Lecture, question-and-answer and impulse-based teaching, class discussion, especially for a holistic approach to a problem, case study work in groups

[*updated 08.04.2025*]

Recommended or required reading:

Legal Basics
Ch. Hirsch: Der Allgemeine Teil des BGB. Systematisches Lehrbuch mit zahlreichen Fällen und Beispielen, Köln (u.a.), Heymanns
H. Brox, W-D. Walker: Besonderes Schuldrecht. Mit Fällen und Aufbauschemata, München, Beck
H. Eisenmann, H. Gnauk, J. Quittnat: Rechtsfälle aus dem Wirtschaftsprivatrecht, Heidelberg, Müller
Bürgerliches Gesetzbuch; Deutscher Taschenbuch Verlag; München
M. Köhler, H.-W. Arndt, Th. Fetzer: Recht des Internet; C. F. Müller Verlag; Heidel-berg/München u. a.
H. Redeker: IT-Recht; Beck Verlag; München
A. Wien: Internetrecht; Gabler Verlag; Wiesbaden
E. Führich: Wirtschaftsprivatrecht, München, Vahlen
E. Klunzinger: Grundzüge des Handelsrechts, München, Vahlen
A. Junker: Grundkurs Arbeitsrecht, München, Beck
L. Michalski: Arbeitsrecht, Heidelberg (u.a.), Müller

Volkswirtschaftslehre
J. Stenger: Volkswirtschaftslehre Kompakt. Grundlagen der VWL in Aufgaben und Lösungen, Saarbrücken
W. Koch, Ch. Czogalla: Grundlagen der Wirtschaftspolitik, Stuttgart
P. A. Samuelson, W. D. Nordhaus: Volkswirtschaftslehre. Das internationale Standardwerk der Makro- und Mikroökonomie, Landsberg am Lech, mi-Fachverl.

[*updated 08.04.2025*]

Management & Controlling

Module name (EN): Management & Controlling

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-340

Hours per semester week / Teaching method:
-

ECTS credits:
5

Academic Year: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Duration 120 min., 100 pts.)
The exam will be written in the 5th Semester (Block 5B) according to the examination schedule. (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO 01.10.2021)
The exam will be written in the 3rd semester (Block 3B) according to the examination schedule. (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO 01.10.2022)

Distribution:
- 20 pts. (24 min) for Managementlehre und Organisationsentwicklung (Management theory and organizational development)
- 40 pts. (48 min) for Controlling
- 40 pts. (48 min) for Qualitätsmanagement (Quality management)

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-340 (P740-0034) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course
DBWI-340 (P740-0034) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 3, mandatory course

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Andreas Metz

Lecturer: Prof. Dr. Andreas Metz

[*updated 11.06.2021*]

Learning outcomes:

Students will be able to see the big picture, identify cross-relationships between individual business areas and develop optimization approaches for the corporate organization. They will explore the guidelines for corporate orientation through normative design elements and thus be able to question the effectiveness of corporate decisions. Students will learn to develop company strategies and implement them in business processes. They will learn that the success of a company depends to a large extent on realistic planning, and that decisions in one area of the company have consequences for all areas. They will learn how to implement such changes in line with a holistic change concept. Students will be familiar with the formal elements of the organization and the different management systems, and will be able to explain the objectives and subject matter behind process organization. Students will also be familiar with aspects of business ethics.

Students will be familiar with controlling tasks and the various options for organizing controlling in a company. They will understand the difference between strategic and operational controlling, be able to apply various strategic controlling tools, and be familiar with common strategic cost management procedures. In addition, they will be familiar with the information, planning, control and management functions of operational controlling and be able to apply the associated methods.

Students will understand the importance of quality in all operational processes, be familiar with the current standards, be proficient in the audit process (product, process and system audit) and know how certification and accreditation are carried out. They will understand how the process capability of machines and processes affects the quality of products. They will be familiar with methods for avoiding defects (FMEA, QFD) as well as methods for testing quality management and will be able to apply management and quality tools.

The Management and Controlling module serves to expand and strengthen professional knowledge and understanding (broadening of knowledge) and instrumental skills. Together with the degree program s scientific-technical and the business administration modules, students will achieve the competence to consider and solve larger interdisciplinary problems and tasks of medium complexity holistically at the interface between production engineering and business administration, and to independently design further learning processes.

[*updated 08.04.2025*]

Module content:

Management Theory and Organizational Development
o Management theory
- Understanding traditional versus new management
- Normative corporate governance as a constraint
- Vision, goals and innovation
- Corporate culture, philosophy and ethics

o Organisational development
- Organizational structure
- Theoretical organizational development models
- Theoretical change management models
- Instruments and methods
- Organizational implementation
- Success monitoring

o Process organization

Controlling
o Controlling basics: Tasks, definition and organization of controlling, distinction between strategic and operational controlling, characteristics of controlling
o Strategic controlling: Basics, strategic analysis, strategy development, selection, implementation and evaluation, strategic cost management
o Operative controlling: Information and reporting, liquidity, budget and financial planning, contribution

margin accounting, key figures and key figure systems, balanced scorecard

Quality Management
o Basic terms
o Quality management, standardization, total quality management, EFQM model
o QM systems based on the ISO 9000 series
o Audit: Product, process and system audit, audit procedure
o Certification and accreditation of QM systems
o QM methods and instruments: failure mode and effects analysis (FMEA), quality function deployment, management tools (M7), quality tools (Q7), process capability, continuous improvement process
o Initial and follow-up sampling

[*updated 08.04.2025*]

Teaching methods/Media:
Lectures: Lectures, demonstrations, question-and-answer teaching, discussion-based teaching, especially for a holistic approach to a problem, working on specific problems in groups

[*updated 08.04.2025*]

Recommended or required reading:

Management Theory and Organizational Development
Dillerup, Ralf; Stoi Roman: Unternehmensführung, München, Vahlen
Olfert, Klaus: Organisation, Ludwigshafen (Rhein), Kiehl
Thommen, Jean-Paul/Achleitner, Ann-Kristin: Allgemeine Betriebswirtschaftslehre, Wiesbaden, Gabler
Thommen, Jean-Paul/Achleitner, Ann-Kristin: Allgemeine Betriebswirtschaftslehre Arbeitsbuch, Wiesbaden, Gabler
Wöhe, Günter/Döring, Ulrich: Einführung in die Allgemeine Betriebswirtschaftslehre, München, Vahlen

Controlling:
B. Britzelmeier: Controlling: Grundlagen, Praxis, Handlungsfelder. Pearson Studium, 2. Auflage, ISBN 978-3868942965
Ch. Eisenschink: Controlling. 200 klausurtypische Aufgaben und Lösungen, NWB Verlag, ISBN 978-3470645728
St. Georg: Die wichtigsten Controlling-Werkzeuge. CreateSpace, ISBN 978-1515186038
H. Jung: Controlling. De Gruyter Oldenbourg, ISBN 978-3110352689

Quality Management:
H. Brüggemann, P. Bremer (2012): Grundlagen Qualitätsmanagement: Von den Werkzeugen über Methoden zum TQM, 1.Auflage, Springer Vieweg Verlag, Wiesbaden, 2012
DIN EN ISO 9000ff Qualitätsmanagementsysteme, Beuth Verlag
ISO/TS 16949:2009 Qualitätsmanagementsysteme, Besondere Anforderungen bei Anwendung von ISO 9001:2008 für die Serien- und Ersatzteilproduktion in der Automobilindustrie; VDA, dritte Ausgabe 2009
G. Linß (2011a): Qualitätsmanagement für Ingenieure, 3.Auflage, Carl Hanser Verlag, Mün-chen, 2011
G. Linß (2011b): Training Qualitätsmanagement: Trainingsfragen Praxisbeispiele Multimediale Visualisierung, 3. Auflage, Fachbuchverlag Leipzig im Hanser Verlag, München, 2011
W. Masing (2007): Handbuch Qualitätsmanagement, Herausgegeben von Thilo Pfeifer, 5., vollst. neu bearb. Aufl., Hanser Verlag, München, 2007
R. Schmitt, T. Pfeifer (2010): Qualitätsmanagement, Strategien Methoden Techniken, 4. Auflage, Carl Hanser Verlag, München, 2010
W. Timischl (2012): Qualitätssicherung: Statistische Methoden, 4.Auflage, Carl Hanser Verlag, München, 2012
Verband der Automobilindustrie e.V., VDA Schriftenreihe Qualitätsmanagement in der

Automobilindustrie
J. Wappis, B. Jung (2010): Taschenbuch Null-Fehler-Management: Umsetzung von Six Sigma, 3. überarbeitete Auflage, Carl Hanser Verlag, München u.a., 2010
J. Scheibler, W. Schuberth: Praxishandbuch Vertrieb mit SAP: So setzen Sie SAP SD erfolgreich ein: Ihr Wegbegleiter für den effizienten Einsatz von SD; SAP PRESS

[*updated 08.04.2025*]

Management Accounting

Module name (EN): Management Accounting

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-360

Hours per semester week / Teaching method:
-

ECTS credits:
5

Academic Year: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Duration 120 min., 100 pts.)
The exam will be written in the 5th semester (Block 5A) according to the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2021).
The exam will be written in the 3rd semester (Block 3A) according to the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October, 1, 2022).

Distribution:
- 50 pts. (60 min) on Cost and Performance Accounting
- 50 pts. (60 min) on Investment and Financing

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-360 (P740-0036) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course

DBWI-360 (P740-0036) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 3, mandatory course

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Thomas Kunz

Lecturer: Prof. Dr. Thomas Kunz

[*updated 11.06.2021*]

Learning outcomes:
After successfully completing this course, students will be able to understand the connection between financial accounting and cost accounting, to reconcile the figures of both accounting groups, to use cost accounting terminology correctly in a business context, to determine the cost level of the individual production factors depending on the design of the cost accounting, to apply and critically assess the procedures of internal cost allocation, and to determine calculation rates for the services of the main cost centers. In addition, they will be familiar with the advantages and disadvantages, as well as the areas of application of a full and a partial cost calculation and a contribution margin calculation. They will be able to calculate target and actual costs, analyze deviations and derive appropriate actions from the results.

With the help of static and dynamic investment appraisal procedures, students will be able to assess the advantages of a single investment in isolation and select the most favorable investment object from several mutually exclusive alternatives. Students will be able to determine the optimal service life and the optimal replacement time. They will be able to apply the financing rules, explain the various options for equity and debt financing, and identify possible solutions to specific problems. Students will be able to take appropriate account of the mutual dependencies between investment, financing, cost and performance accounting, accounting, procurement, production and sales.

[*updated 08.04.2025*]

Module content:

Cost and performance accounting:
o Subareas, tasks and basic concepts of managerial accounting, cost theory fundamentals, principles of cost allocation
o Cost element accounting: tasks, structure and recording cost elements
o Cost center accounting: tasks, internal cost allocation, cost accounting sheet, creation of calculation rates
o Cost object accounting: tasks, division calculation, equivalence number method, overhead allocation, and joint product costing
o Development forms of cost accounting: actual, normal, and planned cost accounting; full and variable cost accounting; contribution margin accounting.

Investment and financing:

o Concepts, types of investment, tasks and problems of investment appraisal
o Static methods of investment calculation: cost comparison, profit comparison, profitability comparison and amortization period calculation
c. Dynamic investment calculation methods: financial mathematical principles, net present value, internal rate of return, annuity and amortization period methods
o Basics of financing: concepts, types of financing, liquidity and financial equilibrium, financing rules
o Equity financing: determining shareholders´ equity, financing through contributions or participation, and equity financing in corporations.
o External financing: characteristics, long-term and short-term external financing
o Internal financing: self-financing, financing through capital release, and financing through provisions

[*updated 08.04.2025*]

Teaching methods/Media:
Lecture: Lecture, demonstration, group work on concrete problems

[*updated 08.04.2025*]

Recommended or required reading:
G. Wöhe, U. Döring G. Brösel: Einführung in die Allgemeine Betriebswirtschaftslehre
L. Haberstock: Kostenrechnung I und II. Berlin, Erich Schmidt Verlag
K.-D. Däumler, J. Grabe: Kostenrechnung 1. NWB Verlag
K. Deimel, G. Erdmann: Kostenrechnung: Das Lehrbuch für Bachelor, Master und Praktiker, Pearson Studium
St. Georg: Basiswissen Kostenrechnung. CreateSpace, ISBN-13: 978-1499634204
St. Georg: Aufgaben und Lösungen zur Kosten- und Leistungsrechnung. Independendly Published, ISBN-13: 978-1520622378
J. Germann: Basiswissen Kostenrechnung. dtv Verlagsgesellschaft
H. P. Becker: Investition und Finanzierung, Wiesbaden, Gabler, München, Vahlen
H. Bieg, H. Kußmaul, G. Waschbusch: Investition, 3. Aufl., (Verlag Franz Vahlen) München 2016.
H. Bieg, H. Kußmaul, G. Waschbusch: Finanzierung, 3. Aufl., (Verlag Franz Vahlen) München 2016.
H. Bieg, H. Kußmaul, G. Waschbusch: Investition in Übungen, 4. Aufl., (Verlag Franz Vahlen) München 2021.
H. Bieg, H. Kußmaul, G. Waschbusch: Finanzierung in Übungen, 4. Aufl., (Verlag Franz Vahlen) München 2017.

[*updated 08.04.2025*]

Manufacturing and Materials Technology

Module name (EN): Manufacturing and Materials Technology

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-240

Hours per semester week / Teaching method:
-

ECTS credits:
5

Academic Year: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Duration 120 min., 100 pts.)
The exam will be written in the 4th semester (block 4A) in accordance with the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2021).
The exam will be written in the 6th semester (block 6A) in accordance with the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2022).

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-240 (P740-0021) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 3, mandatory course
DBWI-240 (P740-0021) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 2, mandatory course

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
DBWI-130 Scientific Basics
DBWI-160

[*updated 31.01.2023*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jan Christoph Gaukler

Lecturer: Prof. Dr.-Ing. Jan Christoph Gaukler

[*updated 11.06.2021*]

Learning outcomes:

Structure and properties of materials:
After successfully completing this module, students be familiar with the basics of the mechanical properties

of metallic materials (elastic behavior, plastic behavior, fracture behavior).: Students will be familiar with the principles behind strength hypotheses and yield conditions, understand the relationships between multiaxial stress states, equivalent stress and dislocation mobility, and be aware of the risks of stress embrittlement and brittle fracture, including in conjunction with notches. They will be able to describe the deformation behavior of metallic materials and will be familiar with the significance of material parameters. They will be able to work with stress-strain diagrams and determine the material parameters from them. Based on the deformation mechanisms at high temperatures and the additional processes that take place at these temperatures, such as recovery, recrystallization and grain coarsening, students will be able to derive relationships between material properties (yield stress, stacking fault energy), manufacturing parameters (temperature, degree of deformation, deformation rate) and product properties (grain size distribution, material characteristics). In addition, they will be able to identify the mechanisms that lead to creep and creep fracture at high temperatures. Furthermore, they will understand strengthening mechanisms (solid solution hardening, precipitation hardening, dispersion hardening, grain refinement, cold working and texture), know their advantages and disadvantages as well as the interactions between them, and know how to use them to produce high-strength materials. Students will be familiar with how cracks form and spread, and the causes of the various types of fracture. They will understand the meaning of fracture work and transition temperature and be familiar with their dependence on metallic lattice structure and temperature, as well as on chemical composition, grain size and strain rate. They will be able to describe the effects of a vibratory load on materials, evaluate fatigue fracture surfaces and work with the Wöhler curve.

Students will understand the basics of heat treatment on age-hardenable Al alloys and the modification of Si-containing Al casting alloys. Furthermore, they will be familiar with the effects of alloying elements in Al alloys and will be able to draw conclusions about processing and usage properties based on chemical composition. In addition, they will understand the alloying concepts of the Al materials commonly used in mechanical engineering and be able to describe and select materials based on their composition, structure and properties.

Students will be able to work with the iron-carbon diagram (metastable) and describe the structure of steels. They will understand the basics of heat treatment (tempering unalloyed and low-alloy steels) and know its effects on structure and properties. Furthermore, they are familiar with the mode of action of alloying elements and can draw conclusions about the processing and usage properties of low- and high-alloy steels based on Fe-Ni, Fe-Cr and Fe-Cr-Ni based on chemical composition. Students will understand the alloying concepts of steels commonly used in mechanical engineering, such as construction, tempering, case-hardening, spring, dual-phase, deep-drawing and AFP steels, as well as steels for screw connections.

Introduction to Manufacturing Engineering:
After successfully completing this module, students will be able to classify manufacturing technologies in the context of production technology, know their interfaces to product development, design technology, materials technology and quality management and will be familiar with the basics of manufacturing accuracy. They will be able to take a holistic view of complex and interconnected manufacturing chains for the production of mechanical engineering products and will be familiar with the manufacturing processes for primary forms (in particular continuous casting, sand casting, gravity and low-pressure die casting, pressure die casting, centrifugal casting), forming (esp. rolling, compressing, extruding, deep drawing) and cutting (esp. turning, drilling, countersinking, reaming, milling, broaching, grinding) in terms of how they work and how they are used. They will be able to select suitable processes and identify and establish their main manufacturing parameters.

Fertigungs- und Werkstofftechnik (Manufacturing and Materials Technology) Lab:
Students will be able to apply selected methods of destructive material testing and metallography under supervision and evaluate the results independently. In the Machining Technology lab, students will become familiar with the different machinability of metallic materials and determine the most important production parameters for the turning and milling processes.

The Manufacturing and Materials Technology module will expand and strengthen students knowledge and

understanding of the subject and their ability to apply it.

[*updated 08.04.2025*]

Module content:

Structure and properties of materials:

Mechanical properties of metallic materials
- o Elastic behavior - introduction: force-distance curve between atoms, normal stresses, strains, Poisson´s ratio, shear stresses, slips, law of elasticity, energy-elastic deformations
- o Elastic behavior - introduction: Deformation mechanism, ductility as a function of the crystal lattice type, influence of the state of stress on dislocation movement, strength hypotheses/yield conditions, notch effect, dislocation movement and reactions
- o Deformation behavior - introduction: Tensile test, stress-strain diagram with continuous flow beginning and with pronounced yield point, material characteristics, Lüders strain, strain aging, Bauschinger effect, true stress-strain diagram, flow stress, degree of deformation, flow curve
- o Deformation behavior at high temperatures: deformation mechanisms, recovery, recrystallization, dependence of flow stress on temperature, strain and strain rate, dependence of grain size distribution of the recrystallized microstructure on temperature and strain, influence of stacking fault energy, strain and strain rate on the grain size distribution of the product, change of material characteristics during recovery and recrystallization, creep including the underlying mechanisms
- o Solidification mechanisms: solid solution hardening, precipitation hardening, dispersion hardening, cold working, grain refinement, texture hardening
- o Fracture behavior: crack formation and propagation, ductile, mixed and brittle fractures, dependence of fracture work on metallic lattice structure and temperature, dependence of transition temperature on chemical composition, grain size and strain rate
- o Fatigue failures: oscillating types of loading, fatigue hardening and crack formation, crack propagation, fatigue failure surface, dependence of the strain amplitude or stress amplitude on the number of cycles, behavior of cold-worked components under cyclic loading, dependence of the crack growth rate on the stress intensity factor range, Paris Law and material characteristics, Wöhler curve, low cycle, high cycle and very high cycle fatigue
- o Creep fractures

Aluminum materials
- o Properties of aluminum
- o Natural hard aluminum alloys of the AlMg type
- o Heat-treatable aluminum alloys: precipitation hardening, hardening heat treatment, alloying concept, technically important alloys
- o Aluminum casting alloys without Si
- o Aluminum casting alloys with Si: Alloying concept, refining, technically important alloys and their properties

Ferrous materials
- o Repetitorium on unalloyed steels
- o Low-alloy steels: Designation, mode of action of the alloying elements (solid solution hardening, inhibition of the transformation of austenite to ferrite and perlite, ferrite stabilization, austenite stabilization, tempering resistance through Si and special carbide formers)
- o High-alloy steels: alloys based on Fe-Ni, Fe-Cr and Fe-Cr-Ni, in particular corrosion-, scale- and wear-resistant Cr steels and corrosion-resistant and heat-resistant austenitic CrNi steels
- o Steels used in mechanical and automotive engineering: construction, tempering, case-hardening, spring, dual-phase, deep-drawing and advanced high-strength steels, steels for screw connections

Introduction to Manufacturing Engineering:

industrial production technology, tasks and interrelations of manufacturing technology, product development process, classification of manufacturing processes

Manufacturing accuracy: definition of accuracy , true value, correct value, empirical value, selection of the appropriate manufacturing process based on order data, geometry, technology and time values, factors influencing accuracy, quality requirements and assurance, quality-oriented manufacturing, manufacturing metrology, systematic and random error, measurement data acquisition, dimensional, form and positional accuracy, surface quality, design deviations, roughness parameters, achievable roughness of manufacturing processes, functional and machine accuracy taking into account static, dynamic and thermal disturbances, tribological wear on tools

Complex 21st-century manufacturing chains: linking metallurgy, materials and production technology, overview of metallurgical processes for the production of raw metal, production of the final metal by molding (ingot casting, continuous casting) and forming (rolling, forging, extrusion), followed by further manufacturing processes for the production of the finished component, practical examples

Primary processing: definition, classification and process overview, casting defects in pure metals and alloys, metallic casting materials, guidelines for the design of castings suitable for casting, technology of the melting shop (tasks and functioning of cupola, induction, , arc, rotary drum, resistance and electron beam furnaces), casting technology (continuous casting, sand casting, gravity and low-pressure die casting, pressure die casting, centrifugal casting)

Forming: definition, production of semi-finished products, production of workpieces, advantages of forming, cold forming, hot forming, dependence of formability on state of stress, temperature, strain rate and material, friction (real material surface, influencing variables, friction laws, wear, lubricants), massive (rolling, forging, extruding, wire drawing, , extrusion molding) and sheet metal forming (deep drawing, stretch forming)

Cutting: definition, classification and process overview, consideration of machining processes in terms of productivity and quality, chip formation, cutting and chip sizes in drilling and turning, cutting edge geometry, chip types, built-up edge, number and class of chip spaces, influence of cutting speed, cutting depth, feed and tool geometry on chip shape, chip grooves on tools, heat generation during and distribution of heat to coolant, chip, workpiece and tool, stability, sizes, conditions and criteria, machining processes with geometrically defined cutting edge (chiseling, filing, turning, drilling, countersinking, reaming, milling, broaching) and with geometrically undefined cutting edge (grinding, honing, lapping)

Fertigungs- und Werkstofftechnik lab

The Fertigungs- und Werkstofftechnik lab is used for practical exercises and to apply the knowledge acquired and explained in the lectures Struktur und Eigenschaften von Werkstoffen and Einführung in die Fertigungstechnik using the following experiments/exercises/tests:

Destructive material testing: tensile testing, hardness test, Charpy impact test
Metallography
Machining processes (turning, milling)

[*updated 08.04.2025*]

Teaching methods/Media:
Lectures: Lecture, demonstrations, questions and impulse teaching, group work on actual problems, class discussion

Labs: Learning and experiencing scientific and technical interrelationships by means of experiments carried out in groups

[*updated 08.04.2025*]

Recommended or required reading:

W. Bergmann: Werkstofftechnik 1 (Carl Haser Verlag)
W. Bergmann: Werkstofftechnik 2 (Carl Haser Verlag)
E. Roos, K. Maile, M. Seidefuß: Werkstoffkunde für Ingenieure
K. Schiebold: Zerstörende und zerstörungsfreie Werkstoffprüfung, Springer Vieweg
A. H. Fritz: Fertigungstechnik, Springer Vieweg
F. Klocke: Fertigungsverfahren 1 Drehen, Fräsen und Bohren, Springer Vieweg
F. Klocke: Fertigungsverfahren 2 Zerspanen mit geometrisch unbestimmter Schneide, Springer Vieweg
F. Klocke: Fertigungsverfahren 4 Umformen, Springer Vieweg
F. Klocke: Fertigungsverfahren 5 Gießen und Pulvermetallurgie, Springer Vieweg

[*updated 08.04.2025*]

Marketing and Sales

Module name (EN): Marketing and Sales

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-350

Hours per semester week / Teaching method:
-

ECTS credits:
5

Academic Year: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Graded exam (Duration 90 min., 100 pts.)
The exam will be written in the 6th semester (Block 6A) according to the exam schedule (Industrial Engineering and Management, Bachelor, ASPO October 1, 2021).
The exam will be written in the 4th semester (Block 4A) according to examination schedule (Industrial Engineering and Management, Bachelor, ASPO October 1, 2022).

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-350 (P740-0035) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course
DBWI-350 (P740-0035) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 3, mandatory course

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jürgen Kohlrusch

Lecturer: Prof. Dr.-Ing. Jürgen Kohlrusch

[*updated 11.06.2021*]

Learning outcomes:
After successfully completing this module, students will be familiar with the principles of creating a marketing mix. Using practical examples, they learn more about the range of marketing policy instruments, in particular product and pricing policy, as well as knowledge about market information procurement and customer behavior. This is followed by concepts for the strategic positioning of capital goods (B2B). Students will have insight into the activities of internal and external sales teams and be familiar with the functions and tasks involved in the technical sales of capital goods. They will also become acquainted with the possibilities of e-commerce. After successfully completing this module, they will be familiar with the similarities and differences online media have compared to traditional media, and know according to which legal basis they can use the internet, mobile apps and social media as a distribution channel. By the end of the course, students will be able to design an advertising, communication and marketing concept for different industries. They will be able to successfully position their company and its products on the market and know what sales measures are necessary to implement their concept in a targeted manner.

The Marketing and Sales module serves to expand and strengthen professional knowledge and understanding (broadening of knowledge) and instrumental skills. Together with the degree program s scientific-technical and the business administration modules, students will achieve the competence to consider and solve interdisciplinary problems and tasks of medium complexity holistically at the interface between production engineering and business administration, and to independently design further learning processes.

[*updated 08.04.2025*]

Module content:

Marketing mix
Service policy, customer retention concepts
Sectoral marketing, B2B versus B2C

Building and protecting brands, image advertising
Advertising psychology and control of advertising effectiveness
AIDA concept, implementation in classic and online media
Capital goods marketing
Market research instruments
USPs
Porter´s strategies for competition
E-commerce and the ins and outs of online marketing
E-branding, search engine optimization (SEO), content management systems (CMS)
Newsletter, Virales Marketing, Soziale Medien, Influencer-Marketing
Difference between sales and marketing
Distribution channels and sales channels
Setting up sales organizations
Internal and external sales tasks
Designing and implementing trade fairs, exhibitions and campaigns
Customer loyalty strategies
Special features in the distribution of capital goods
How to structure your offers
Sales and complaint-related discussions
Following-up leads
Sales controlling

[*updated 08.04.2025*]

Teaching methods/Media:
Lectures: Lectures, demonstrations, question-and-answer teaching, discussion-based teaching with use cases, especially for a holistic approach to a problem, working on specific problems in groups

[*updated 08.04.2025*]

Recommended or required reading:
Ch. Homburg: Marketingmanagement, Springer Gabler
Ch. Homburg: Übungsbuch Marketingmanagement, Springer Gabler
H. Meffert, Ch. Bumann, M. Kirchgeorg, M. Eisenbeiß: Marketing, Springer Gabler
P. Winkelmann: Marketing and sales, Odenbourg Verlag
M. Bruhn: Integrierte Unternehmens- und Markenkommunikation: Strategische Planung und operative Umsetzung, Schäffer Pöschel

[*updated 08.04.2025*]

Mathematics for Industrial Engineers 3

Module name (EN): Mathematics for Industrial Engineers 3

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-210

Hours per semester week / Teaching method:
-

ECTS credits:
5

Academic Year: 2

Mandatory course: yes

Language of instruction:
German

Assessment:

Graded exam (Duration 120 min., 100 pts.)
The exam will be written in the 3rd Semester (Block 3A) written according to exam schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2021).
This exam will be written in the 5th semester (block 5A) in accordance with the examination schedule (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2022).

Distribution:
- 40 pts. (48 min) for Mathematik-3 (Mathematics-3)
- 60 pts. (72 min) for Stochastik (Stochastic)

Prerequisites for receiving credits:
The achievement of at least 40 out of 100 points in the module exam.
The grade corresponds to the student s performance in the module exam and is shown as a decimal grade according to the htw saar grading scheme.

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-210 (P740-0018) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 3, mandatory course
DBWI-210 (P740-0018) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 2, mandatory course

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
DBWI-110
DBWI-120

[*updated 31.01.2023*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jan Christoph Gaukler

Lecturer: Prof. Dr.-Ing. Jan Christoph Gaukler

[*updated 11.06.2021*]

Learning outcomes:

After successfully completing this module, students will be familiar with mathematical calculation techniques that they can apply to individual mathematical problems as well as to problems in physics and technology. They will be able to perform arithmetic operations with vectors. They will be able to determine the position of points, lines and planes in relation to one another. Students will be familiar with complex numbers and functions and will be able to convert complex numbers into different forms of representation. They will be able to perform complex calculations and apply their knowledge to represent harmonic oscillations.

Students will be able to independently solve statistical problems from the field of economics. They will be able to process and graphically display larger amounts of data, as well as analyze and interpret results. They will be able to analyze and critically question presented statistics and the results of their evaluation. They will have mastered the fundamentals of probability theory and be able to use suitable statistical estimation methods to draw conclusions from a sample about the parent population.

[*updated 08.04.2025*]

Module content:

Contents of lectures and tutorials for Mathematics for Industrial Engineers 3:
Vector calculus:
- o Vector operations
- o Dot, cross and triple product
- o Linearly independent vectors
- o Examples of applications

Applications of vector calculus in geometry:
- o Representing a straight line
- o Representing a plane
- o The position of points, lines and planes in relation to one another

Complex numbers and functions:
- o Definition
- o Forms of representation
- o Complex calculations
- o Harmonic oscillations

Contents of lectures and tutorials for Stochastic:
Descriptive statistics
- o Classification and presentation of data
- o Average values
- o Measures of variability around the arithmetic mean
- o Measures of variability around the median
- o Other measures of variability: range and geometric standard deviation
- o Index numbers
- o Correlation and Regression
- o Time series analysis

Probability theory and combinatorics
- o Basics
- o Random variables
- o Limit theorems

Introduction to Inductive Statistics: From Sample to Population
o Point estimate
o Interval estimate

[*updated 08.04.2025*]

Teaching methods/Media:
Lecture: Lecture, demonstration, working on specific problems in groups.
Exercises: Group work on concrete problems

[*updated 08.04.2025*]

Recommended or required reading:

L. Papula: Mathematik für Ingenieure und Naturwissenschaftler Band 1, Springer Vieweg Wiesbaden
L. Papula: Mathematik für Ingenieure und Naturwissenschaftler Band 2, Springer Vieweg Wiesbaden
G. Bamberg, F. Baur, M. Krapp: Statistik, München, Oldenbourg
G. Bamberg, F. Baur: Statistik-Arbeitsbuch. Übungsaufgaben, Fallstudien, Lösungen, München (u.a.), Oldenbourg
G. Fischer: Stochastik einmal anders. Parallel geschrieben mit Beispielen und Fakten, vertieft durch Erläuterungen, Wiesbaden, Vieweg

[*updated 08.04.2025*]

Practical Training Module 1

Module name (EN): Practical Training Module 1

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-190

Hours per semester week / Teaching method:
-

ECTS credits:
13

Academic Year: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Non-graded course credit in accordance with the requirements for poster presentations after the first practical module at the ASW in "Technik" (Technology).
The poster presentation will take place at the end of block 2B (2nd semester; mid/end of August) as part of the seminar Professionelles Präsentieren (Professional Presentations).

Prerequisites for receiving credits:
Passing the above-mentioned academic achievement (= passed grade from the examination board)

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBMAB-190 (P720-0036) Mechanical Engineering / Production Technology, Bachelor, ASPO 01.10.2021 , study year 1, mandatory course
DBWI-190 (P740-0016) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 1, mandatory course
DBWI-190 (P740-0016) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 1, mandatory course

Workload:
The total student study time for this course is 390 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Andreas Metz

Lecturer: Prof. Dr. Andreas Metz

[*updated 11.06.2021*]

Learning outcomes:
Professional Presentations:
This seminar is part of the academic supervision provided by the study director.
Students will have mastered the basics of presentation techniques. They will be able to prepare and develop presentations in a systematic and targeted manner.
They will be familiar with the main forms of presentation (speaking freely, or holding a talk with slides or screen presentation support) and will be able to use these in their own presentations. In addition, they will be able to integrate things such as product demonstrations or films into their presentations in an appropriate manner. In addition, they will be able to describe and understand technical problems from operational practice in a written paper (poster presentation).

Practical phase (= practical professional activities):
As part of their practical work, students will gain first insights into applying the basics from their field of study in operational practice. Under instruction:
They can describe narrowly defined problems according to predetermined principles, continue their learning processes in a narrowly defined area and acquire up-to-date knowledge. In subject areas with which they are familiar, students will be able to apply various fundamental methods and procedures on their own.
Furthermore, students will be familiar with the basic processes in their respective companies and will be able to present these appropriately. In this module, students will thus apply their knowledge to their professional activities for the first time and thus, be able to this knowledge to include practical issues and skills.

The aim of practical module 1 is to expand and strengthen instrumental skills and to develop systemic skills in collecting, evaluating and interpreting relevant information, as well as in independently designing further

learning processes.

[*updated 08.04.2025*]

Module content:
Seminar: Professional Presentations:

Basics of presentation techniques,
Setting goals and monitoring success,
Systematic preparation of a presentation (target group analysis, technical preparation, risk analysis),
Logical structure and dramaturgy of a presentation,
Resources and how to use them
Alternative presentation forms

Practical work experience in the resp. company:

This part of the dual study program gives students an understanding of industrial practice by providing them with basic practical skills (including manual skills) in departments with the following focus: design engineering, manufacturing technology (molding, forming, cutting, joining, coating, changing material properties), plastics technology, quality assurance, materials testing, damage analysis, assembly and maintenance.

[*updated 08.04.2025*]

Teaching methods/Media:
Seminar: Stimulated and question-based teaching, demonstrations in individual, partner and group work, classroom discussion
Practical phase: Practical work in the company providing the training (developed) in individual, partner and/or group work

[*updated 08.04.2025*]

Recommended or required reading:

[*updated 08.04.2025*]

Practical Training Module 2

Module name (EN): Practical Training Module 2

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-380

Hours per semester week / Teaching method:
-

ECTS credits:
6

Academic Year: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Non-graded course work according to the specifications for poster presentation after the second practical module at the ASW in the field of study Technik" (Technology).
o The topic is a business problem in the area of production management. It will be handed out on the first working day of the 1st week of Block 5B (5th semester) (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2021).
o The project work comprises 165 hours which are to be completed within a period of 60 working days (Mon-Fri excluding public holidays) from the date on which the topic was assigned to the student.
o The poster presentation will take place during the Practical Training Module 2 seminar at the end of block 5B (5th semester) (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2021).

Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO October 1, 2022:
o The topic is a business problem from the field of production management. It will be handed out on the first work day of the 1st week of Block 3B (3rd semester).
o The project work comprises 165 hours which are to be completed within a period of 60 working days (Mon-Fri excluding public holidays) from the date on which the topic was assigned to the student.
o The poster presentation will take place during the Practical Training Module 2 seminar at the end of block 3B (3rd semester).

Prerequisites for receiving credits:
Passing the above-mentioned academic achievement (= passed grade from the examination board)

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-380 (P740-0038) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course
DBWI-380 (P740-0038) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 3, mandatory course

Workload:
The total student study time for this course is 180 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Andreas Metz

Lecturer: Prof. Dr. Andreas Metz

[*updated 11.06.2021*]

Learning outcomes:
Practical Training Module 2 seminar
This seminar is part of the scientific support provided by the director of studies and serves here to reflect in particular on the skills acquired and experiences gained in the practical phase in ethical, social, ecological and societal terms.

Practical Phase (= practical professional activities):
The practical phase (Practical Training Module 2) in block 5B (5th semester) is part of the module, which consists of experiment protocols, homework, practical module 1 (with the seminar Professional Presentations), a practical project (with project work and the seminar Project Management), a practical assignment (with the seminar Scientific Work), Practical Module 2 and the bachelor thesis, which together prepare students for dealing with larger problems and tasks independently using scientific methods, including the associated discussion.
Students will strengthen their instrumental skills by applying the knowledge acquired so far in the various subject areas to a practical project of medium complexity in the field of production management. They will demonstrate that they are capable of developing or improving solutions to technical problems by applying scientific methods with little guidance. Students will be proficient in analyzing problem situations and choosing appropriate methods to solve problems. This module aims at building systemic competence by gathering, evaluating and interpreting relevant information in the context of the practical project.
Communicative skills are strengthened by the fact that students must work in a team within their respective company and take responsibility for the project they did there, and by the fact that they must defend the results of their practical project in a discussion and exchange ideas with engineers and other scientists.

[*updated 08.04.2025*]

Module content:

Practical Training Module 2 seminar:
Presentation of the results of the practical project worked on in the practical stage 5B, taking into account scientific-technical, ethical, social and ecological aspects, including a discussion
Reflection on the experiences gained during the practical stage (social, possibly intercultural)

Practical Phase (= practical professional activities):
In Block 5B (4th semester), students will work on a specific operational problem or project, which takes a total of 165 hours to complete. They will solve or further develop this project according to scientific methods with limited guidance from a suitably qualified in-house supervisor within 60 working days. The topic of the project is proposed by the company and examined, approved and assigned by the Head of Studies. The poster presentation in the Practical Module 2 seminar serves as documented proof of the practical work.

[*updated 08.04.2025*]

Teaching methods/Media:
Seminar: Class discussion
Practical phase: Practical work experience in a company providing the training (developed) in individual, partner and/or group work

[*updated 08.04.2025*]

Recommended or required reading:

[*updated 08.04.2025*]

Practice-Oriented Project

Module name (EN): Practice-Oriented Project

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-270

Hours per semester week / Teaching method:
-

ECTS credits:
12

Academic Year: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
2X ungraded course work
Written project work (ungraded)
The topic is a problem from the fields of business administration, production engineering or production management. Topics will be allocated on the first working day of the first week of block 4A (4th semester) (Industrial Engineering and Management, Bachelor, ASPO October 1, 2021).
The project work is a 240-hour study assignment that is completed in a period of 60 working days (Mon-Fri, excluding public holidays) from the time the topic is assigned.
Project presentation (ungraded)
The presentation (PowerPoint presentation) will take place as part of the seminar Project Management in the first four weeks of block 4B (4th semester; June - early July) (Wirtschaftsingenieurwesen/Produktionsmanagement, Bachelor, ASPO 01.10.2021).

Industrial Engineering/Produktionsmanagement, Bachelor, Allgemeine Studien- und Prüfungsordnung (General Study and Examination Regulations) 01.10.2022:
Written project work (ungraded)
The topic is a problem from the fields of business administration, production engineering or production management. It will be handed out on the first working day of the 1st week of Block 6A (6th semester).
The project work is a 240-hour study assignment that is completed in a period of 60 working days (Mon-Fri, excluding public holidays) from the time the topic is assigned.
Project presentation (ungraded)
The presentation (PowerPoint presentation) takes place as part of the Project Management seminar in the first four weeks of block 6B (6th semester; June - early July).

Prerequisites for receiving credits:
Passing both of the above-mentioned academic achievements (= passed grade from the examination board)

[*updated 08.04.2025*]

Applicability / Curricular relevance:

DBWI-270 (P740-0024, P740-0025) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 3, mandatory course
DBWI-270 (P740-0024, P740-0025) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 2, mandatory course

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Andreas Metz

Lecturer: Prof. Dr. Andreas Metz

[*updated 11.06.2021*]

Learning outcomes:

Project management:
This seminar is part of the academic supervision provided by the study director. After successfully completing this module students will have mastered the basics of project management, be able to define project goals, structure projects, estimate costs and plan the implementation. They will be able to recognize and avoid project pitfalls. They will be able to systematically analyze risks and deviations from targets and develop appropriate measures. In addition, they will be able to systematically prepare decisions and moderate the decision-making process.

Students will be able to present their project work in the context of an academic seminar paper in which the essential facts regarding the problem definition, the state of knowledge, the approach (including project planning), implementation and evaluation, and the important conclusions, including an outlook, are worked out and presented. In the ensuing scientific discussion, students will be able to demonstrate that they can defend subject-related positions and solutions to problems in a well-argued manner and exchange ideas with engineers and other scientists about their project work.

Practice-oriented project (= practical professional activity):
The practice-oriented project in Block 4A (4th semester) is designed to prepare students for working independently on larger problems and tasks using scientific methods, including the associated discussions. It consists of experiment protocols, homework, a practical module 1 (with the "Professionelles Präsentieren seminar), a practical project (with project work and the Projektmanagement seminar), practical work (with the "Wissenschaftliches Arbeiten seminar), the practical module 2 and the Bachelor thesis.

Students will strengthen their instrumental skills by applying the knowledge they have acquired to date from the various subject areas to a simple, larger practical project in the field of business administration (in particular cost and performance accounting as well as investment and financing), mechanical engineering with a focus on production technology or production management. They will show that they can develop or further develop solutions to technical problems by applying scientific methods under supervision. Students

will be proficient in analyzing problem situations and choosing appropriate methods to solve problems. They will be able to present their approach and results appropriately.

This project aims at building instrumental expertise in the sense of the application of knowledge and understanding. This module aims at building systemic competence, in particular by gathering, evaluating and interpreting relevant information in the context of the practical project. Communicative skills are strengthened by the fact that students must work in a team within their respective company and take responsibility for the project they did there, and by the fact that they must defend their project work in a discussion and exchange ideas with engineers and other scientists.

[*updated 08.04.2025*]

Module content:

Project Management seminar:
Fundamentals of project management (formulating objectives, structure, planning, control)
Recognizing and avoiding project pitfalls
Systematic decision-making, risk analysis, and analysis of target/actual deviations and problem-solving techniques
Presenting your project and taking part in a subsequent scientific discussion

Practice-Oriented Project
In Block 4A (4th semester), students will tackle a specific operational problem or project, devoting a total of 240 hours to it. Under the guidance of a suitably qualified company supervisor, they will develop or further develop the project according to scientific methods within a period of 60 working days. The topic of the project is proposed by the company and examined, approved and assigned by the Head of Studies. As documented proof of the practical work involved in completing this project, the student will write a 25- to 30-page project report that includes an introduction, the state of knowledge, the approach (including project planning), the implementation and evaluation, and the conclusions and outlook.

[*updated 08.04.2025*]

Teaching methods/Media:
Seminar: Impulse and question teaching, demonstrations in individual, partner and group work, class discussions, scientific discussions
Practice-oriented project: Practical work experience in the resp. company

[*updated 08.04.2025*]

Recommended or required reading:

[*updated 08.04.2025*]

Scientific Basics

Module name (EN): Scientific Basics

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-130

Hours per semester week / Teaching method:
48UV+32UU+16UP (96 teaching units)

ECTS credits:
5

Academic Year: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 120 min.

[*updated 29.08.2025*]

Applicability / Curricular relevance:

DBING-130 (P750-0004, P750-0005, P750-0006) Integrated Sustainable Building Technology, Bachelor, SO 01.10.2024 , study year 1, mandatory course
DBMAB-130 (P720-0020, P720-0021, P720-0022) Mechanical Engineering / Production Technology, Bachelor, ASPO 01.10.2021 , study year 1, mandatory course
DBWI-130 (P740-0005, P740-0006, P740-0007) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 1, mandatory course
DBWI-130 (P740-0005, P740-0006, P740-0007) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 1, mandatory course

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
DBWI-220
DBWI-230 Electrical Engineering
DBWI-240 Manufacturing and Materials Technology

[*updated 31.01.2023*]

Module coordinator:
Prof. Dr.-Ing. Jan Christoph Gaukler

Lecturer: Prof. Dr.-Ing. Jan Christoph Gaukler

[*updated 11.06.2021*]

Learning outcomes:
Basic Chemistry:

After successfully completing this module, students will be familiar with the essential basics of general chemistry, including atomic structure, the periodic table of elements, chemical bonding, states of matter, chemical reactions and chemical thermodynamics. They will understand the connection between the electron configuration of the atoms, the structure of the periodic table and the properties of the elements derived from it. They will be able to describe the chemical bonding of substances, prepare molecular formulas and, in the case of covalently bonded substances, also structural formulas, and derive structure-property relationships. Students will be familiar with the basic principles of chemical reactions (reaction equation, stoichiometry, equilibrium, redox and acid-base reactions) and can apply them in order to interpret simple chemical processes. This includes the use of simple, chemical calculations. Students will be familiar with the basic principles of chemical thermodynamics (thermochemistry, chemical reaction processes, catalysts, and inhibitors) and chemical reaction kinetics and will be able to apply this knowledge to interpret and calculate simple chemical processes.

Experimental Physics:

Students will be familiar with the scientific principles of the dynamics of a single point mass and systems of point masses. They will be familiar with the basic terms, phenomena and concepts and understand the physical relationships. This knowledge will enable students to reduce simple engineering problems to basic physical principles or questions, to answer these physical questions independently using mathematical methods, and thus, find a solution to the actual engineering problem in a targeted manner.

Chemistry Lab:

They will be able to set up and perform basic chemical experiments. Based on observations and existing knowledge, they will be able to derive conclusions and link them to the contents of the "General Chemistry" lecture. In addition, students will also be able to write lab reports/experiment reports.

Physics Lab:

By means of experiments, students will independently study the essential physical principles of the mechanics of rigid and real (liquids, gases) bodies, as well as waves, optics, atomic and quantum physics. They will be able to set up basic, physical experiments, carry out series of experiments and measurements and evaluate them, taking into account the calculation of errors. In addition, they will be able to draw conclusions after critically evaluating measurement results and to prepare laboratory reports/test reports.

[*updated 29.08.2025*]

Module content:
Basic Chemistry:

Atomic structure and the periodic system of elements: Classical elementary particles, structure of atoms, isotopes, orbital model, electron configuration, structure of the periodic table
Chemical Bonding:: Ionic bonding, covalent bonding, metallic bonding, dispersion, induction, and dipole-dipole interactions, hydrogen bonding, structure-property relationships
States of Matter: (ideal gases, Boyle´s, Gay-Lussac´s, and Avogadro´s laws, ideal gas equation), liquids, crystalline and amorphous solids, structural principles of ideal crystals, coordination number, Bravais lattice, metallic lattice structures, packing density, Miller indices, lattice vacancies and their significance for alloy formation)
Homogeneous mixtures (gas mixtures and Dalton´s law, solutions, single-phase alloys), heterogeneous

mixtures
Chemical Reactions: Reaction equations and stoichiometry, equilibrium, redox and acid-base reactions, chemical thermodynamics (reaction heat, energy and enthalpy, enthalpy of formation, Hess´s law, reaction entropy, chemical reaction sequences, free enthalpy, catalysis (homogeneous, heterogeneous))

Experimental Physics:

Units of measurement, measuring physical quantities and calculating errors
Mechanics of point masses: One- and multidimensional motion, average velocity, instantaneous velocity, average acceleration, instantaneous acceleration, velocity-time and distance-time laws, free fall, projectile motion, uniform circular motion, angular velocity, centripetal and centrifugal acceleration, Newton´s axioms, momentum, gravitational, spring, normal, and frictional forces, air resistance, work and power in conservative and non-conservative force fields, kinetic energy, potential energy of gravity near the Earth´s surface and in general, spring energy, total energy of a mass point, conservation of energy, superimposed force fields
Mechanics of a system of mass points: Center of mass, velocity, acceleration, force, momentum and conservation of momentum, systems with variable mass (thrust force and velocity of a rocket; basic rocket equation), impact processes (conservation of momentum, energy and angular momentum, types of impact [elastic, inelastic, superelastic], elasticity number)

Chemistry Lab:
Laboratory and safety regulations
Experiments on acid-base reactions, buffer systems, quantitative determination (titration), electrochemistry, and redox chemistry
Qualitative and quantitative analysis of water (ion detection, hardness determination)

Physics Lab:
Unit of measurement, measuring physical quantities and calculating errors
Experiments in mechanics and optics
Experiments in atomic and quantum physics

[*updated 29.08.2025*]

Teaching methods/Media:
Lectures: Presentation, work on specific problems in groups
Exercises: Group work on concrete problems
Labs: Self-study and hands-on experience with scientific concepts through partner work involving experiments.

[*updated 29.08.2025*]

Recommended or required reading:
J. Hoinkis, E. Lindner: Chemie für Ingenieure (Wiley-VCH)
P. W. Atkins, J. de Paula: Physikalische Chemie (Wiley-VCH)
P. A. Tipler, G. Mosca: Physik für Wissenschaftlicher und Ingenieure (Springer)
D. Gross, W. Hauger, J. Schröder, W. Wall: Technische Mechanik 3: Kinetik (Springer)
R. C. Hibbeler: Technische Mechanik 3 Dynamik (Pearson)

[*updated 28.04.2023*]

Work, Human Resources and Leadership

Module name (EN): Work, Human Resources and Leadership

Degree programme: Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021

Module code: DBWI-330

Hours per semester week / Teaching method:
-

ECTS credits:
5

Academic Year: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
1 graded module exam consisting of 2 parts:
An oral exam (Introduction to Work, Human Resources and Leadership, Human Resources Management, Occupational Science, 60 pts.)
The oral exam takes place in the 5th semester (Block 5A) according to the examination schedule.

A written exam (Human Resource Management: Duration 60 min., 40 pts.)
This exam is written in the 6th semester (Block 6A) according to the examination schedule.

Note:
The reason for dividing the examination into two parts, one of which is written in Block 5A (5th semester) and the other in Block 6A (6th semester),
is to distribute the workload evenly.

[*updated 08.05.2023*]

Applicability / Curricular relevance:

DBWI-330 (P740-0039) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2022 , study year 2, mandatory course
DBWI-330 (P740-0039) Industrial Engineering / Production Management, Bachelor, ASPO 01.10.2021 , study year 3, mandatory course

Workload:
The total student study time for this course is 150 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Andreas Metz

Lecturer: Prof. Dr. Andreas Metz

[*updated 11.06.2021*]

Learning outcomes:
After successfully completing this module, students will understand the importance of the "human" factor in the context of production management and be familiar with the influences of leadership, flexibilization, mobility and digitization on working environments.

They will have mastered basic techniques of management by objectives . They will be able to define, agree and evaluate goals for themselves and their team. They will be able to give appreciative feedback and appropriately classify and represent themselves and their role in the operational context.

They will be able to take on management tasks within the framework of business management by designing and optimizing work systems and processes, as well as structuring and evaluating tasks and processes in terms of time. They will be familiar with the relevant laws and the basic principles of ergonomic workplace design.

They will be familiar with human resource management (basic terms, development/trends, strategic aspect, organization of human resource work). In addition to personnel planning and selection, students will be familiar with the topics of "personnel deployment and compensation". They will be able to evaluate the basic principles of company remuneration determination and structuring. To this end, they will be familiar with the basics of collective bargaining law and works constitution law, as well as the various methods of wage determination. With regard to personnel deployment, they will be familiar with the different modalities and variants of personnel deployment (e.g. training, working hours, leave, fixed-term employment, work environment, work design measures). Students will be familiar with the basics of onboarding new employees and the principles of workplace design.

The "Work, Personnel and Leadership" module will increase and strengthen students professional competence. Together with the degree program s scientific-technical and the business administration modules, students will achieve the competence to consider and solve larger interdisciplinary problems and tasks of medium complexity holistically at the interface between production engineering and business administration, and to independently design further learning processes.

[*updated 08.05.2023*]

Module content:
Introduction to work, human resources and leadership
- o The "human" factor and its importance in the context of production management
- o How people experience work and the importance they give to it
- o Influence of leadership, flexibilization, mobility and digitalization on work environment design

Human resources management
- o Basics of leadership through target agreements
- o JoHaRi windows - the art of giving feedback
- o Teams and leadership
- o Leading the boss
- o Communication at eye level
- o Psychological games in leadership processes

Human factors and ergonomics

Introduction to human factors and ergonomics
- o Occupational Health and Safety Act, Operational Safety Ordinance
- o Work system: Definition and description of a work system, types of work systems (single-, group-, single- and multi-job work)
- o Workplace design; stress and strain concept
- o Process ergonomics
- o Anthropometry, workplace design

Human resource management
- o Human resources management at a glance: Introduction, basic terms, influencing factors, prerequisite for successful human resources work
- o Organizing human resources work: Human resources management tasks, classification and structure of the human resources department, trends in and future of human resources management
- o Personnel planning and selection: Procedure and process of personnel planning, personnel requirements, job description and requirement profile, general equal treatment act, personnel selection
- o Staffing: Staff planning, inducting new employees, division of labor, extending tasks, place of work (inside/outside, abroad, workplace design), working hours, different types of employment relationships
- o Personnel compensation: Wages, other compensation components, wage levels, fairness of wages, collective bargaining agreements, works constitution law, employment contracts, wage determination (based on requirements, qualifications, performance and market), forms of compensation (basic wages, supplementary wages, wages without performance)

[*updated 08.05.2023*]

Recommended or required reading:

Human Resources Management

Friedemann Schulz von Thun "Miteinander reden" rororo ISBN-10: 3499627175

Hartmut Laufer "Grundlagen erfolgreicher Mitarbeiterführung" GABAL-Verlag GmbH; 10. Auflage ISBN-10: 3897495481

Reinhard K. Sprenger: Mythos Motivation (Wege aus einer Sackgasse) 16. Aufl. 1999

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