Course Handbook Engineering and Management Master

created at 04.03.2024,11:48

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Deputy Chairman of Examination	Prof. Dr. Marco Günther

Qualifikation Goals of Study Programme

Engineering and Management Master - mandatory courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Advanced Biotechnology	MAM_19_V_1.06.BIT	P241-0018, P241-0019	1	3V+1S	5	Prof. Dr. Timo Gehring
Advanced Energy and Power Engineering	MAM_19_V_3.07.ETV	P241-0037	3	2V+2U	5	Prof. Dr.-Ing. Christian Gierend
Analysis and Instrumentation in Process Engineering	MAM_19_V_1.07.AMV	P241-0004, P241-0005	1	2V+2P	5	Prof. Dr.-Ing. Christian Gierend
Applied Numerical Simulations (Fluid Mechanics / Heat Transport)	MAM_19_M_3.03.ASF	P241-0006	3	2V+1P	3	Prof. Dr. Marco Günther
Applied Numerical Simulations (Mechanical Systems)	MAM_19_M_1.02.ASM	P241-0007	1	3V+2P	7	Prof. Dr. Marco Günther
Commercial Corporate Management	MAM_19_A_2.02.KOU	P241-0059, P241-0060	2	2V+2S	5	Prof. Dr. Moritz Habschied
Decentralized Power Generation and Renewable Energy Systems	MAM_19_V_2.09.DER	P241-0025, P241-0026	2	4SU+2P	7	Prof. Dr.-Ing. Michael Sauer, M.Sc.

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Digital Twin	MAM_19_V_3.09.DZW	P241-0029	3	2V+1P+1PA	5	Prof. Dr.-Ing. Michael Sauer, M.Sc.
Energy and Mass Transfer in Process Engineering	MAM_19_V_1.05.ESV	P241-0032	1	4V+2PA	7	Prof. Dr. Matthias Faust
Environmental Process Technology and Chemical Reaction Engineering	MAM_19_V_2.08.UVR	P241-0089	2	3V+1S	5	Prof. Dr. Timo Gehring
Hydraulic Servo-Motors	MAM_19_PE_2.04.SHY	P241-0087	2	2V+2U	5	Prof. Dr.-Ing. Jochen Gessat
Industrial Design, Ergonomics and Ethics	MAM_19_PE_3.06.IEE	P241-0052, P241-0053, P241-0054	3	3V+2PA+1S	7	Prof. Dr. Bernd Heidemann
Industrial Manufacturing 1	MAM_19_IP_1.08.IP1	P241-0055	1	2V+2S	5	Prof. Dr. Jürgen Griebsch
Industrial Manufacturing 2	MAM_19_IP_2.10.IP2	P241-0056	2	4V+4S	10	Prof. Dr. Jürgen Griebsch
Interdisciplinary Product Development	MAM_19_PE_1.04.IPE	P241-0057, P241-0058	1	4V+2PA	10	Prof. Dr. Bernd Heidemann
Legislation and Regulation	MAM_19_A_1.03.RER	P241-0085	1	3V+1U	5	Studienleitung
Master Thesis (with Research Colloquium)	MAM_19_A_4.01.MAK	T241-0064	4	-	30	Studienleitung
Meetings, Negotiating and Intercultural Communication	MAM_19_A_2.01.MNI	P241-0065	2	2S	2	Prof. Dr. Christine Sick
Motion Control Technology	MAM_19_PE_2.05.BWT	P241-0013, P241-0014	2	3V+2P	5	Prof. Dr. Andrea Bohn

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Plant Engineering and Component Selection	MAM_19_V_2.07.ATK	P241-0008	2	4SU+2PA	6	Prof. Dr. Matthias Faust
Product Development Using New Material Concepts	MAM_19_PE_2.06.PEW	P241-0067	2	4V+2PA	8	Prof. Dr. Bernd Heidemann
Production Systems 1	MAM_19_IP_1.09.PS1	P241-0075, P241-0076	1	1V+2SU+1P	5	Prof. Dr. Jürgen Griebsch
Production Systems 2	MAM_19_IP_2.11.PS2	P241-0077	2	5PA	8	Prof. Dr. Jürgen Griebsch
Production Systems 3	MAM_19_IP_3.10.PS3	P241-0078	3	5PA	7	Prof. Dr. Jürgen Griebsch
Production-Oriented Corporate Management	MAM_19_M_3.05.POU	P241-0073, P241-0074	3	3V+1S	5	Prof. Dr. Andrea Bohn
Project Management	MAM_19_V_3.08.PRM	P241-0081, P241-0082	3	4V	5	Prof. Dr. Matthias Faust
Reading, Writing and Presenting for Academic Purposes	MAM_19_A_3.02.RWP	P241-0083, P241-0084	3	2S	2	Prof. Dr. Christine Sick
Research and Development	MAM_19_A_3.01.FEP	P241-0045	3	2PA	10	Studienleitung
The Statistics and Theory of Numerical Simulation	MAM_19_A_1.01.MTS	P241-0088	1	5V+3U	8	Prof. Dr. Marco Günther

(29 modules)

Engineering and Management Master - optional courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Current Methods in Molecular and Microbiology	MAM.2.1.6.20		-	2V+1P	3	Prof. Dr. Timo Gehring
Experiment Design and Quality Control	MAM.2.1.2.29	P241-0367	-	2V	3	Prof. Dr. Gerald Kroisandt
Labor Law	MAM_19_2.2.24	P241-0373	-	-	2	Prof. Dr. Ralf Oetinger
Membranes and Membrane Processes	MAM_19_2.2.25	P241-0407	2	2SU	3	Prof. Dr. Matthias Faust
Non-Linear Finite Elements	MAM_19_2.2.26	P241-0408	2	1SU+3PA	5	Prof. Dr.-Ing. Ramona Hoffmann

(5 modules)

Engineering and Management Master - mandatory courses

Advanced Biotechnology

Module name (EN): Advanced Biotechnology
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_V_1.06.BIT
Hours per semester week / Teaching method: 3V+1S (4 hours per week)
ECTS credits: 5
Semester: 1
Mandatory course: yes

Language of instruction:
German

Assessment:
Oral examination 20 min. (80%), presentation (20%)

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_V_1.06.BIT (P241-0018, P241-0019) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Process Engineering

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Timo Gehring

Lecturer: Prof. Dr. Timo Gehring

[*updated 21.03.2019*]

Learning outcomes:
After successfully completing this module, students will have in-depth knowledge about bioprocess and environmental engineering and will be able to explain and dimension essential processes.

[*updated 04.11.2020*]

Module content:
Advanced biochemistry, advanced microbial metabolic physiology, gene regulation, taxonomy,
Advanced genetic engineering, vectors of gene transfer, viruses, plasmids, biotechnological methods for transferring genetic material to other living beings, possibilities and risks of genetic engineering, sterile technology,
Industrial microbiology, production processes for microbial products, upstream processing, downstream processing, separation processes, food technology,
- Energetic utilization of biomass in decentralized plants (plant technology and operation)
Combustion, thermal gasification, fermentation, plant technology and operating behavior
- Water treatment
Drinking water, municipal wastewater (nitri, deni, phosphate,..), industrial wastewater, aerobic/anaerobic treatment
- Environmental processes of gaseous products
Desulphurization processes, exhaust gas cleaning, exhaust air cleaning, dimensioning plants with internal cycles, total cost optimization, CO2 recovery, industrial production-integrated environmental protection,
Current aspects of bioprocess, environmental and process technology: Key topics from the fields of industrial microbiology, bioprocess engineering, environmental technology, environmental process engineering and related fields are offered. In addition to lectures, students will work on topics from current

international publications in self-study, present and discuss them. Lectures from both industry and applied research, as well as visits to selected companies will also be an important part of the course. Thirdly, overarching aspects of the topics will also be examined, such as economic efficiency, ethics and global relevance. And, time will also be reserved for visiting selected relevant companies.

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture, seminar, presentations by students on selected topics based on original English language literature, Visits to important companies, plants and trade fairs, presentations by external experts, group work on dimensioning environmental technology plants,

[*updated 04.11.2020*]

Recommended or required reading:
DWA u. DVGW Arbeitsblätter: A131 etc.
ATV Handbuch: Biologische Abwassernigung
Brock et.al.: Mikrobiologie
Ottow et.al.: Umweltbiotechnologie
Fleischhauer et.al.: Angewandte Umwelttechnik
Kraume: Verfahrenstechnik
Chmiel: Bioverfahrenstechnik

[*updated 04.11.2020*]

Advanced Energy and Power Engineering

Module name (EN): Advanced Energy and Power Engineering

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_V_3.07.ETV

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

ECTS credits:
5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 90 min.

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_V_3.07.ETV (P241-0037) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course, Specialization Process Engineering

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Christian Gierend

Lecturer:
Prof. Dr.-Ing. Christian Gierend

[*updated 18.02.2020*]

Learning outcomes:
Learning outcomes:

Professional skills:
After successfully completing this module, students will know how to set up, plan and operate thermal plants, such as waste-to-energy plants (MHKW). They will be familiar with the historical, social and political backgrounds that must be taken into consideration in planning, design and approval procedures. They will be familiar with and understand the individual components of a system, can name variants and explain how they work. They will be familiar with the legal basis for planning and operation. The students will be familiar with the control engineering side of plant operation and will be familiar with sensors, actuators, controls and process control systems.

Methodological skills:
Knowledge acquired about basic subjects will be deepened in application-specific areas. Students will understand and be able to apply methods from the fields of thermodynamics, physics, chemistry, biology, automation engineeringapplied in the context of the plant. They will be able to develop and implement legal requirements on the basis of legal texts. Students will be able to safely apply specialized methods for the calculation of characteristics and design parameters (for incineration plants: bunker size, annual capacity, availability, water/steam cycle, turbine, district heating, electricity, etc.)

Social skills:
After successfully completing this module, students will be able to analyze problems together as a group and work on them independently as a project. They will be able to divide a project into sub-projects in order to work on them independently. Research, the presentation of solutions and discussions will take place in small groups. Students will learn to communicate confidently with regulatory authorities. They will be able to present their final results clearly and reliably.

Personal competence:
After successfully completing this course, students will be able to use the tools safely and evaluate the results of their work. They will understand the necessity of legal limits and the technical measures to monitor them. They will be able to assess and classify measurement results with regard to their accuracy and validity

[*updated 04.11.2020*]

Module content:

1. Significance of thermal waste treatment plants in the waste management concepts / Necessity of plants for thermal waste treatment / Justifying the selected plant size
2.

Tasks and planning basis
_ Framework schedule / introduction / preliminary planning / basic evaluation
_ Site search / approval planning for ROV (regional planning procedure) and PFV (plan approval procedure)
_ Planning the system
_ Environmental impact study / conceptual design / first explanatory report
_ Regional planning procedure
_ Construction / Approval procedure

3. Waste management framework data
_ The generation of waster / individual waste fractions

4. Site-related framework data

5. Plant concept

6. Wastewater-free exhaust gas cleaning

7. Waste treatment and disposal

8. Stack and emission monitoring

9. Operational concept

10. Conclusion

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture notes, lecture guide, exercises

[*updated 04.11.2020*]

Recommended or required reading:
Various handbooks,
Sources from the Internet

State approval procedures (Saarland)

[*updated 04.11.2020*]

Analysis and Instrumentation in Process Engineering

Module name (EN): Analysis and Instrumentation in Process Engineering
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_V_1.07.AMV
Hours per semester week / Teaching method: 2V+2P (4 hours per week)
ECTS credits: 5
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Written exam 90 min. + term paper + lab experiment [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_V_1.07.AMV (P241-0004, P241-0005) Engineering and Management, Master, ASPO 01.10.2019, semester 1, mandatory course, Specialization Process Engineering
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr.-Ing. Christian Gierend
Lecturer: Prof. Dr.-Ing. Christian Gierend

[*updated 18.02.2020*]

Learning outcomes:
Learning outcomes:

Professional skills:
After successfully completing this module, students will have an overview of the most important analysis and instrumentation techniques that are technically relevant to process engineering. They will be familiar with measurement methods that are important for monitoring material and energy flows. They will be familiar with the processing chain for measurement data: measurement sensor; measurement transducer; storing / recording measurements. Students will have in-depth knowledge about the physical and chemical processes of measuring sensors.

Methodological skills:
After successfully completing this module, students will have mastered the safe handling of analytics and measurement technology. They will be able to apply analytical procedures according to scientifically specified workflows. They will be familiar with and understand the evaluation and selection criteria, as well as the legal requirements for selecting and using measurement technology and will be able to apply them. Governmental regulations and guidelines, as well as industrial standards will also be considered and applied.

Social skills:
After successfully completing this course, students will be able to communicate technical and legal requirements, to document them and to communicate them clearly. They will be able to discuss in small groups, analyze problems and develop suitable solution strategies.

Personal competence:
After successfully completing this course, students will be able to use the tools safely and evaluate the results of their work. They will understand the necessity of legal limits and the technical measures to monitor them. They will be able to assess and classify measurement results with regard to their accuracy and validity

[*updated 04.11.2020*]

Module content:
...

[*updated 04.11.2020*]

Recommended or required reading:

[*still undocumented*]

Applied Numerical Simulations (Fluid Mechanics / Heat Transport)

Module name (EN): Applied Numerical Simulations (Fluid Mechanics / Heat Transport)

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_M_3.03.ASF
Hours per semester week / Teaching method: 2V+1P (3 hours per week)
ECTS credits: 3
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: Written exam 60 min. [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_M_3.03.ASF (P241-0006) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course
Workload: 45 class hours (= 33.75 clock hours) over a 15-week period. The total student study time is 90 hours (equivalent to 3 ECTS credits). There are therefore 56.25 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): MAM_19_A_1.01.MTS The Statistics and Theory of Numerical Simulation   [*updated 10.03.2020*]
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Marco Günther
Lecturer: Prof. Dr. Marco Günther [*updated 21.03.2019*]
Learning outcomes: After successfully completing this module, students will be able to mathematically describe fluid mechanics. They will be familiar with the typical numerical implementation on both the theoretical and practical level. The students will be familiar with the handling and phenomena of higher fluid mechanics such as turbulence modelling, multiphase flow, heat transport mechanisms. [*updated 04.11.2020*]

Module content:
- Introduction and derivation of the fluid mechanics models
- Principles of the finite volume method
- Principles of grid generation
- Performing simulations with various tools such as Comsol Multiphysics and Ansys Fluent
- Introduction to the turbulence model, multiphase flows, heat transport
- Real experiments and simulation of the processes on the computer

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture und practical course at the computer: 2 hours per semester week

[*updated 04.11.2020*]

Recommended or required reading:
Literature will be announced in the lecture.

[*updated 04.11.2020*]

Applied Numerical Simulations (Mechanical Systems)

Module name (EN): Applied Numerical Simulations (Mechanical Systems)

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_M_1.02.ASM

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

ECTS credits:
7

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 60 min.

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_M_1.02.ASM (P241-0007) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course

Workload:

75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 210 hours (equivalent to 7 ECTS credits).
There are therefore 153.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
MAM_19_2.2.26 Non-Linear Finite Elements

[*updated 29.03.2022*]

Module coordinator:
Prof. Dr. Marco Günther

Lecturer: Prof. Dr. Marco Günther

[*updated 21.03.2019*]

Learning outcomes:
After successfully completing this module, students will be able to grasp and understand physical phenomena and describe them mathematically. Based on this, they will be able to simulate engineering problems numerically and analyze and critically evaluate the results.
Another competence is the operation and handling of simulation software such as Comsol Multiphysics.

[*updated 04.11.2020*]

Module content:
- Basics of Matlab/Octave and Simulink (repetition or short introduction)
- Dynamic systems with ordinary differential equations
- Introduction to the Finite Element method
- Derivation of the mathematical description of various physical-technical processes (ordinary and partial differential equations) such as heat conduction, structural mechanics and their implementation and numerical simulation using software tools
- Mathematical modeling
- Application of free and commercial FE-simulation tools (e.g. Comsol Multiphysics)

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture + practical exercises on the computer: 5 hours per semester week

Lecture slides, tutorials, practical computer work

[*updated 04.11.2020*]

Recommended or required reading:
Literature will be announced in the lecture.

[*updated 04.11.2020*]

Commercial Corporate Management

Module name (EN): Commercial Corporate Management
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_A_2.02.KOU
Hours per semester week / Teaching method: 2V+2S (4 hours per week)
ECTS credits: 5
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Written exam (40%) 120 min. Project work (60%) [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_A_2.02.KOU (P241-0059, P241-0060) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Moritz Habschied
Lecturer: Prof. Dr. Ralf Oetinger   [*updated 18.02.2020*]

Learning outcomes:
After successfully completing this module, students will be able to make a rough assessment of a company from a commercial point of view using the methodological skills they learned. They will be familair with the risk areas of a company.

This includes knowledge about external and internal accounting, the preparation of business plans, risk and insurance issues, as well as funding opportunities for innovations, business start-ups, etc.

The theoretical content will be deepened through group work.

[*updated 04.11.2020*]

Module content:
1. External accounting and financial reporting
2. Internal accounting with corporate planning and key figures
3. Corporate management risks and their prevention
4. Public funding opportunities for innovation, business start-ups etc.
5. Benchmarking using practical examples
6. Corporate planning and preparing business plans

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture with group work, lectures by students (partly in groups), exercises for the lecture, handouts, excursions to various service providers

[*updated 04.11.2020*]

Recommended or required reading:
Wöhe: Einführung in die Allgemeine Betriebswirtschaftslehre, 2008.
Hufnagel: Einführung in die Buchführung und Bilanzierung. Betriebswirtschaft in Studium und Praxis, 2008.
Heinzelmann, Wie versichere ich mein Unternehmen?. Recht und Praxis, Leitfaden zu BVG, Personen-, Taggeld-, Sach-, Haftpflicht- und Spezialversicherungen, 2001.
Häfner: Entwicklung eines Businessplanes im Geschäftsbereich digitale Medien, 2009.

[*updated 04.11.2020*]

Decentralized Power Generation and Renewable Energy Systems

Module name (EN): Decentralized Power Generation and Renewable Energy Systems

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_V_2.09.DER

Hours per semester week / Teaching method:
4SU+2P (6 hours per week)

ECTS credits:
7

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Oral examination 25 min. (80%,), project work (20%)

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_V_2.09.DER (P241-0025, P241-0026) Engineering and Management, Master, ASPO 01.10.2019
, semester 2, mandatory course, Specialization Process Engineering

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Michael Sauer, M.Sc.

Lecturer:
Prof. Dr.-Ing. Michael Sauer, M.Sc.

[*updated 05.03.2020*]

Learning outcomes:
After successfully completing this module, students will be familiar with and have mastered sound decision-making principles for the selection and operation of decentralized energy generators.
They will understand and be able to evaluate the challenges of and associated decisions by and for the energy system transition in Germany, also in terms of international agreements.
They will have deepened their knowledge regarding the market motivation for the construction and operation of regenerative energy plants, energy distribution networks and energy storage systems, so that they can make reliable statements regarding their use from a technical, ecological and economic point of view

[*updated 04.11.2020*]

Module content:
Current laws: EEG (The Renewable Energy Sources Act) and ENEV (The German Energy Saving Ordinance), development of expansion plans for renewable energy production.

Cogeneration plants

Design criteria for cogeneration
CHP plants with piston engine, micro gas turbine, Stirling engine, small steam turbines and fuel cells
Dimensioning cogeneration plants from the point of view of power or heat supply.
Influence of legal requirements on future use

Mechanical, hydraulic, compressed air and electrical energy storage

Electrical power grids:
Tasks of the grid operators
AC and DC power transmission
Challenges posed by grid expansion

Biomass:
Thermal utilization in decentralized plants (plant technology, operating behavior and operation)
Biogas and power-to-gas
Different generations of biofuels

Refrigeration systems and heat pumps
Thermodynamic basics
Compression refrigeration machines
Absorption and adsorption refrigeration systems
Operating behavior of heat pumps

Wind turbines and other flow energy converters:
Physical principles
Turbine components
Control devices
Design criteria
Differences between onshore and offshore plants
Laws
Compensation models

Solar thermal power:
Component design and optimization
Optimizing the design of solar collectors
Storage tank design and dimensioning
Other components and plant safety
Collector system operating technology (control and legionella problems)

Photovoltaics:
The inner photoelectric effect
The P-n junction
Solar cell technologies
Design and function of PV modules
Basic understanding of inverters and battery storage systems

Virtual power plant, construction, function and motivation for construction

The electricity exchange in Leipzig and Paris: What is traded? How and why?

[*updated 04.11.2020*]

Teaching methods/Media:
Seminaristic lecture. Students must prepare and present at least one topic. The topics will be distributed at

the beginning of the lecture and presented after an one-on-one discussion. The lecture will be complemented by lectures from experts and visits to renewable energy production plants. Practical exercises such as recording a solar cell characteristic curve independently or experiments on different heat exchangers will promote a better understanding of the various regenerative energy converters.

[*updated 04.11.2020*]

Recommended or required reading:
Duffie, Beckmann, Solar Engineering of thermal processes, Wiley
Hadamovsky, Solaranlagen, Vogel
http://bine.fiz-karlsruhe.de
Jungnickel,H., et al.: Grundlagen der Kältetechnik, Verlag Technik Khartchenko, N.V. Solaranlagen, Vogel.
Kaltschmitt, Erneuerbare Energieträger, Springer.
Quaschnig, Regenerative Energiesysteme, Vogel.
Wagner, Photovoltaik Engineering
Zahoransky, A.: Energietechnik, Vieweg

[*updated 04.11.2020*]

Digital Twin

Module name (EN): Digital Twin

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_V_3.09.DZW

Hours per semester week / Teaching method:
2V+1P+1PA (4 hours per week)

ECTS credits:
5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Practical examination with term paper

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_V_3.09.DZW (P241-0029) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course, Specialization Process Engineering

Workload:
60 class hours (= 45 clock hours) over a 15-week period.

The total student study time is 150 hours (equivalent to 5 ECTS credits).
There are therefore 105 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Michael Sauer, M.Sc.

Lecturer:
Prof. Dr.-Ing. Michael Sauer, M.Sc.

[*updated 07.05.2019*]

Learning outcomes:
After successfully completing this module, students will be familiar with the possibilities and techniques of using digital twins for process development and optimization and be able to apply them themselves.
They will understand the Internet of Things and Big Data as interdisciplinary topics of mechanical engineering and electrical engineering. They will be able to explain, simulate and analyze selected technical solutions.

[*updated 04.11.2020*]

Module content:
Based on the example of simple technical systems, their virtual twins will be developed and simulations carried out, data will be generated and compared. With clearly defined goals, students will be able to increase their general understanding of the developed system by reading out the individual data and creating a visual image. In this manner, it is possible to carry out optimizations in the development phase.
Students will receive deeper insight into the Internet of Things. They will become familar with network-enabled sensors and learn to work with them themselves. They will practice the automated evaluation of sensor data and handling large amounts of data. Based on the exemplary generation of neural networks, students will learn techniques that can be used to generate a model image based on measured data.

[*updated 04.11.2020*]

Teaching methods/Media:
Seminaristic instruction. Compact lecture during the first part of the module. Students will develop simulation models with data modelling and the analysis of e.g. flow systems, photovoltaic systems, energy storage, combined heat and power plants and networks using scientific articles and (Labview-/AMESim-)templates.

[*updated 04.11.2020*]

Recommended or required reading:

[*still undocumented*]

Energy and Mass Transfer in Process Engineering

Module name (EN): Energy and Mass Transfer in Process Engineering
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_V_1.05.ESV
Hours per semester week / Teaching method: 4V+2PA (6 hours per week)
ECTS credits: 7
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Oral examination 20 min. [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_V_1.05.ESV (P241-0032) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Process Engineering
Workload: 90 class hours (= 67.5 clock hours) over a 15-week period. The total student study time is 210 hours (equivalent to 7 ECTS credits). There are therefore 142.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Matthias Faust
Lecturer: Prof. Dr. Matthias Faust [*updated 17.02.2022*]
Learning outcomes: Advanced thermodynamics and chemical thermodynamics: After successfully completing this part of the

module, students will be able to explain the difference between ideal and real processes, establish and calculate energy balances of real processes, calculate states of ideal and real mixtures, explain thermodynamic equilibria of simple chemical reactions and calculate equilibrium constants and equilibrium turnover.

Mass Transfer: After successfully completing this part of the module, students will be able to set up and calculate mass balances, be familiar with, understand, be able to explain and calculate mass transport mechanisms, be familiar with, understand and be able to explain the interaction of mass transport and reactions, and understand the function of a solid catalyst in a gas or liquid phase reaction.

Thermal Process Engineering: After successfully completing this part of the module, students will be familiar with, understand, explain and be able to calculate basic operations and apparatuses in energy technology and thermal process engineering based on practical examples.

[*updated 19.05.2023*]

Module content:
Advanced thermodynamics and chemical thermodynamics:
Introduction and basic terms
Equations of State, changes of state, total differential
Models for describing real gases
Thermal equation of state for real gases
Thermal and energetic properties of mixtures
Ideal, real mixtures, state variables, critical data
Air, steam, water and ice, state changes in the h-x diagram
Determining the molar heat capacities of ideal gases, chemical equilibrium, equilibrium constants, chemical potential, free enthalpy
Chemical equilibrium in technical reactions
Thermodynamics of the fuel cell

Mass Transfer
Fundamentals of mass transfer, stationary diffusion and convection, diffusion coefficients in gases, liquids and solids, mass transfer coefficients, mass transfer, mass transfer, thermo-diffusion, pressure diffusion, force diffusion, transient diffusion, two-film theory, diffusion and reaction, mechanism of heterogeneous catalysis,
Principles of industrial catalysis

Thermal process engineering
Introduction and basic terms, material and energy balances, phase diagrams, drying, evaporation, distillation, rectification, ternary mixtures, extraction
Laboratory experiment on rectification

[*updated 19.05.2023*]

Teaching methods/Media:
Lecture, accompanying laboratory experiment on rectification, student presentations, guide to the lecture, collection of formulae, exercises for the lecture, tasks for worksheets and presentations.

[*updated 19.05.2023*]

Recommended or required reading:
B. Lohrengel, Thermische Trennverfahren, De Gruyter, 2017.
S. Seiffert, W. Schärtl, Physikalische Chemie kapieren, De Gruyter, 2021.
E. L. Cussler, Diffusion, Mass Transfer in Fluid Systems, Cambridge, 2005.

[*updated 19.05.2023*]

Environmental Process Technology and Chemical Reaction Engineering

Module name (EN): Environmental Process Technology and Chemical Reaction Engineering
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_V_2.08.UVR
Hours per semester week / Teaching method: 3V+1S (4 hours per week)
ECTS credits: 5
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Oral examination 20 min. [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_V_2.08.UVR (P241-0089) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Process Engineering
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Timo Gehring
Lecturer: Prof. Dr. Timo Gehring [*updated 21.03.2019*]

Learning outcomes:
After successfully completing this module, students will be able to identify environmental problems and develop methods to solve them, dimension them and estimate their costs.
They will be familiar with the main types of reactors and will be able to explain their construction, special features and application,

[*updated 04.11.2020*]

Module content:
Advanced industrial wastewater treatment and anaerobic technology, advanced environmental technology, soil remediation, exhaust air purification, selected current topics in environmental technology, sustainable technologies and processes, cost estimation,
Current aspects of bioprocess, environmental and process technology: Key topics from the fields of industrial microbiology, bioprocess engineering, environmental technology, environmental process engineering and related fields are offered. In addition to lectures, students will work on topics from current international publications in self-study, present and discuss them. Lectures from both industry and applied research, as well as visits to selected companies will also be an important part of the course. Overarching aspects of the course topics will also be examined, such as economic efficiency, ethics and global relevance. And, time will also be reserved for visiting selected relevant companies.

Introduction and basic terms, types of performance in reactors, reaction kinetics, Q-D diagram, reaction order, elementary, isochoric, irreversible, homogeneous reactions, elementary, isochoric, reversible, homogeneous reactions, reactions with catalysts, reactor types, residence time behavior of reactors, pulse function and frequency function, step function and transition function, ideal reactors, real reactors, conversion integral

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture, seminar, presentations by students on selected topics based on original English language literature, Visits to important companies, plants and trade fairs, presentations by external experts, group work on dimensioning environmental technology plants,

[*updated 04.11.2020*]

Recommended or required reading:
DWA u. DVGW Arbeitsblätter: A131 etc.
ATV Handbuch: Biologische Abwasserreinigung
Brock et.al.: Mikrobiologie
Ottow et.al.: Umweltbiotechnologie;
Fleischhauer et.al.: Angewandte Umwelttechnik;
Kraume: Verfahrenstechnik
Chmiel: Bioverfahrenstechnik

[*updated 04.11.2020*]

Hydraulic Servo-Motors

Module name (EN): Hydraulic Servo-Motors

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_PE_2.04.SHY

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

ECTS credits:
5

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 90 min.

[*updated 04.11.2020*]

Applicability / Curricular relevance:

DFMME-2b1 (P610-0450) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Product Development
MAM_19_PE_2.04.SHY (P241-0087) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Product Development

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

Recommended prerequisites (modules):
MAM_19_A_1.01.MTS The Statistics and Theory of Numerical Simulation

[*updated 02.03.2020*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Jochen Gessat

Lecturer: Prof. Dr.-Ing. Jochen Gessat

[*updated 21.03.2019*]

Learning outcomes:
After successfully completing this submodule, students will be familiar with the architectures of electrohydraulic drive systems (e.g. valve-controlled linear and rotary drives, hydrostatic axes, variable-speed drive systems with motor pump units).

They will be able to explain the basic structure and function of the required components (pumps and motors, cylinders, electro-hydraulic valves, sensors for position/angle detection).

Students will be able to create model equations and structure diagrams of electrohydraulic drive systems.

Using predefined simulation software, students will be able to transfer the above structure diagrams into the creation of a model.

Students will be able to derive parameters for the creation of simulations from manufacturer data and measurements on existing component test benches and implement them.

Using digital simulation, they will be able to analyze the static and dynamic behavior of electrohydraulic drive systems.

[*updated 04.11.2020*]

Module content:
Architectures of electrohydraulic drive systems
Components: Pumps, motors, cylinders, electrohydraulic valves, sensors, electronics
Electrohydraulic timing chain
Electrohydraulic control circuit
Model equations and structure diagrams
Simulation of a selected example drive
Static and dynamic analysis of simulation results, optimization

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture/tutorials
Digital simulations
Experiments

[*updated 04.11.2020*]

Recommended or required reading:
Servohydraulik, 4. Auflage Hubertus Murrenhoff
Lecture transcript RWTH Aachen

ISBN: 978-3-8440-0947-7

Grundlagen elektrohydraulischer Antriebe und Steuerungen
Siegfried Helduser
Vereinigte Fachverlage
ISBN-13: 978-3783003871

[*updated 04.11.2020*]

Industrial Design, Ergonomics and Ethics

Module name (EN): Industrial Design, Ergonomics and Ethics

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_PE_3.06.IEE

Hours per semester week / Teaching method:
3V+2PA+1S (6 hours per week)

ECTS credits:
7

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Design: Term paper (30%)
Ergonomics: Written exam 90 min. (40%)
Ethics: Seminar presentation (30%)

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_PE_3.06.IEE (P241-0052, P241-0053, P241-0054) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course, Specialization Product Development

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Bernd Heidemann

Lecturer:
Prof. Dr. Bernd Heidemann
N.N.
Daniel Kelkel, M.Sc.

[*updated 13.02.2023*]

Learning outcomes:
Industrial design:
After successfully completing this part of the module, students will be familiar with basic terms and design strategies of industrial design and apply these when developing technical products.

Ergonomics:
After successfully completing this part of the module, students will be able to include ergonomics as a factor in the development and design of products in order to increase their usability, user friendliness and safety.
They will be able to design human-machine systems and their environment in such a way that the variability of humans is taken into account with regard to their physiological and anthropometric characteristics, as well as their cognitive characteristics.

Ethics in Engineering:
After successfully completing this part of the module, students will be familiar with basic concepts of ethics and can apply them to engineering sciences.
Students will be able to identify ethical conflicts, distinguish between legal and ethical perspectives and assess options for action with the help of ethical concepts.
Student will be able to take a position on ethical conflicts, argue accordingly and act responsibly.

[*updated 04.11.2020*]

Module content:
Industrial design:
The terms design and industrial design
Design history and eras
Design elements and strategies

Ergonomics:
1. Introduction - history, terms, fields of application, man-machine-environment system
2. 2. The human in focus - physiology, anthropometry, psychology
3. 3. How ergonomics sees the human being - manifestations of human work, load/stress concept
4. The services that humans can provide - the ability to perform, the willingness to perform
5. 5. Introduction to the design of human-machine systems - design levels, objectives
6. Anthropometric and biomechanical aspects - basics, body measurements, body position
7. Physiological design - basics, design examples, posture, standing, sitting
8. Psychological design - basics, design examples
9. 9.2 Information technology design - human system element, design of displays and control elements
10. Software ergonomics - advantages, design principles
11. Designing environmental influences - light. color, climate, noise

Ethics in Engineering:
Concepts of applied ethics in the engineering sciences: Distinction moral-ethics, moral concepts, moral values and principles, the principle of responsibility
Ethical dimensions of engineering activities
Technology assessment, environmental ethics
Professional responsibility: questions and guidelines
Ethical concepts - ethics concepts
Current and historic case studies

[*updated 04.11.2020*]

Teaching methods/Media:
Industrial design: Seminaristic instruction/practical course (in cooperation with the HBK saar)
Ergonomics: Interactive lecture
Ethics: Seminaristic instruction

[*updated 04.11.2020*]

Recommended or required reading:
Industrial design:
Heufler, G.: Design Basics - Von der Idee zum Produkt. Verlag Niggli
Habermann, H.: Kompendium des Industrie-Design: Von der Idee zum Produkt - Grundlagen der Gestaltung. Springer-Verlag.
Godau, M.: Produktdesign: Eine Einführung mit Beispielen aus der Praxis. Verlag Birkhäuser

Ergonomics:
Bullinger: Ergonomie
Laurig: Grundzüge der Ergonomie
Schmidtke: Ergonomie
Zühlke: Menschengerechte Bedienung technischer Geräte

Ethics:
Michael Quante: Einführung in die Allgemeine Ethik. Verlag wbg Academic.
Armin Grunwald, Stephan Saupe (Hrsg.): Ethik in der Technikgestaltung - Reflexionen zum Verhältnis von Ethik und Praxis. Verlag Springer.
Lutz Hieber, Hans-Ullrich Kammeyer: Verantwortung von Ingenieurinnen und Ingenieuren. Springer-Verlag.
Volker Pfeifer: Ethisch argumentieren - Eine Anleitung anhand von aktuellen Fallanalysen. Verlag Schöningh.
Günter Ropohl: Ethik und Technikbewertung. Verlag Suhrkamp.

[*updated 04.11.2020*]

Industrial Manufacturing 1

Module name (EN): Industrial Manufacturing 1

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_IP_1.08.IP1

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

ECTS credits:
5

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 100% (120 min.)

[*updated 04.11.2020*]

Applicability / Curricular relevance:

DFMME-1a1 (P610-0445) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Industrial Production
MAM_19_IP_1.08.IP1 (P241-0055) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Industrial Production

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
MAM_19_IP_2.10.IP2 Industrial Manufacturing 2
MAM_19_IP_3.10.PS3 Production Systems 3

[*updated 06.04.2020*]

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer:
Prof. Dr. Jürgen Griebsch

[*updated 06.04.2020*]

Learning outcomes:
After successfully completing this module, students will have learned to understand the manufacturing processes in their context, i.e. their sequential integration into process sequences and production cycles.
They will be aware of technological and economic interrelationships in order to select - depending on lot sizes and total purchase quantities - the processes that will lead to the best results with regard to accuracy with drawings, feasibility, quality and supplier reliability.
Students will be able to evaluate and calculate components.
They will be familiar with the interrelationships and processes inherent in project management.
Students will have learned the basics of different management methods and will be able to place them in the context of different, company-specific conditions.

[*updated 04.11.2020*]

Module content:
Selecting manufacturing processes:
- Laser tools / joining technology
- Industrial measurement & sensor technology
- Production-oriented design

Project management/business administration and basic concepts
- Machine hour rate calculations and base object costing based on quantity structures, call-off figures and delivery dates
- Target costing and determining fair market prices on the basis of technically feasible solutions
- Patents and patent searches

- Project management (budgets, management accounting, flow charts, etc.)
- Understanding leadership and leadership tasks

[*updated 04.11.2020*]

Teaching methods/Media:
Lectures that alternate with seminars.

[*updated 04.11.2020*]

Recommended or required reading:

Bliedtner, J., Müller, H., Barz, A.; Lasermaterialbearbeitung - Grundlagen, Verfahren, Anwendungen, Beispiele; Hanser Verlag, 2013; ISBN: 978-3-446-42168-4

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

Hoenow, G., Meißner, T.; Entwerfen und Gestalten im Maschinenbau; Hanser Verlag, 2016; ISBN: 978-3-446-44340-2

Gevatter, Grünhaupt; Handbuch der Mess- und Automatisierungstechnik in der Produktion; Springer Verlag, 2006; ISBN: 978-3-540-21207-2

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

Kremin-Buch, B.; Strategisches Kostenmanagement: Grundlagen und moderne Instrumente. Mit Fallstudien; Gabler Verlag, 2012; ISBN 978-3-8349-9216-1

Fajen, A.; Erfolgreiche Führung multikultureller virtueller Teams: Wie Führungskräfte neuartige Herausforderungen meistern; Springer Gabler Verlag, 2018; ISBN: 978-3658232672

[*updated 04.11.2020*]

Industrial Manufacturing 2

Module name (EN): Industrial Manufacturing 2

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_IP_2.10.IP2

Hours per semester week / Teaching method:
4V+4S (8 hours per week)

ECTS credits:
10

Semester: 2

Mandatory course: yes
Language of instruction: German
Assessment: Written exam 100% (120 min.) [*updated 04.11.2020*]
Applicability / Curricular relevance: DFMME-2a1 (P610-0448) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Industrial Production MAM_19_IP_2.10.IP2 (P241-0056) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Industrial Production
Workload: 120 class hours (= 90 clock hours) over a 15-week period. The total student study time is 300 hours (equivalent to 10 ECTS credits). There are therefore 210 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): MAM_19_IP_1.08.IP1 Industrial Manufacturing 1 MAM_19_IP_1.09.PS1 Production Systems 1 [*updated 06.04.2020*]
Recommended as prerequisite for: MAM_19_IP_3.10.PS3 Production Systems 3 [*updated 10.07.2019*]
Module coordinator: Prof. Dr. Jürgen Griebsch
Lecturer: Prof. Dr. Jürgen Griebsch [*updated 06.04.2020*]
Learning outcomes: After successfully completing this module students will be familiar with the functional areas of a company and will be able to identify their interaction with reference to the Smart Cubes project, i.e. their influence on the design of the system (e.g. requirements QA, shipping, personnel, etc.). Students will learn how to behave in an industrial, intercultural environment. Using case studies, students will have learned which solution strategies are necessary to identify and eliminate supply bottlenecks, liquidity problems, declining sales, etc. They will be able to perform simulations using modern digital tools (software) in order to shorten the times e.g. for material flow, business planning, etc. and reduce costs.

[*updated 04.11.2020*]

Module content:
- Value stream design
- Material flow analysis
- CAE tools: Plant simulation
- Moderation and leadership
  1. Moderator
  2. Communication as the basis for moderation
  3. Principles of mediation
  4. Guide to moderation
  5. Cultural aspects of moderation
- Business simulation game
  - o Business processes
  - o Business plan

Applied automation (practice & theory) with comparison of solutions in the industrial production lab and industrial solutions for:
- Hardware solutions for industrial applications
- Control
- Robotics
- Sensor technology

[*updated 04.11.2020*]

Teaching methods/Media:
_Lecture and seminar

[*updated 04.11.2020*]

Recommended or required reading:
Pawellek, G.; Ganzheitliche Fabrikplanung - Grundlagen, Vorgehensweise, EDV-Unterstützung; Springer Verlag, 2014; ISBN: 978-3-662-43727-8

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

Freimuth, J., Barth, T.; Handbuch Moderation - Konzepte, Anwendungen und Entwicklungen; Hogrefe Verlag Göttingen, 2014; ISBN: 978-3-8409-2375-3

Fajen, A.; Erfolgreiche Führung multikultureller virtueller Teams: Wie Führungskräfte neuartige Herausforderungen meistern; Springer Gabler Verlag, 2018; ISBN: 978-3658232672

Werner, H.; Supply Chain Management - Grundlagen, Strategien, Instrumente und Controlling; Springer Gabler Verlag, 2017; ISBN: 978-3-658-18383-7

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

Hesse, S.; Grundlagen der Handhabungstechnik; Hanser Verlag, 2016; ISBN: 978-3-446-44432-4

[*updated 04.11.2020*]

Interdisciplinary Product Development

Module name (EN): Interdisciplinary Product Development
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_PE_1.04.IPE
Hours per semester week / Teaching method: 4V+2PA (6 hours per week)
ECTS credits: 10
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Written exam 120 min. (50%) + Project (50%) [*updated 04.11.2020*]
Applicability / Curricular relevance: DFMME-1b1 (P610-0447) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Product Development MAM_19_PE_1.04.IPE (P241-0057, P241-0058) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Product Development
Workload: 90 class hours (= 67.5 clock hours) over a 15-week period. The total student study time is 300 hours (equivalent to 10 ECTS credits). There are therefore 232.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: MAM2.1.3.24   [*updated 23.08.2021*]

Module coordinator:
Prof. Dr. Bernd Heidemann

Lecturer:
Prof. Dr. Bernd Heidemann
Daniel Kelkel, M.Sc.
M.Eng. Oliver Müller

[*updated 22.02.2024*]

Learning outcomes:
After successfully completing this module, students will be familiar with special procedures and methods for the interdisciplinary development of complex technical (cross-over) products.
They will be able to adapt, modify and further develop procedures according to product and project-specific needs.
Students will be familiar with the aspects of sustainable product development and will be able to integrate them into development projects.
They will be able to familiarize themselves with the latest technological trends and developments that can be used to increase the benefits of integration in a product.
Students will be able to organize group dynamic processes within a team (e.g. create a project plan, coordinate cooperation, identify and distribute work packages), apply them (e.g. for generating, discussing and evaluating solutions) and master them (e.g. in case of sudden, unforeseeable, or interpersonal influences).

[*updated 04.11.2020*]

Module content:
Introduction _ Terms and definitions
The technical product - needs and requirements. Generating and satisfying demand.

Special process models for product development, e.g. VDI guideline, the "V-Model", the "Münchener" model_

Discursive and intuitive problem solving: Principles of creativity and creativity techniques.

Special methods for clarifying tasks: e.g. quality function deployment and modifications, use of social media and online tools.

Special methods and models for designing: The technical, tangible product as a system for transformation. Abstraction models that are based on systems engineering and used to plan and structure complex, interdisciplinary (cross-over, 4.0 and higher) products with the transformations of material, energetic and informational variables. A special focus will be placed on the design of a benefit-oriented and benefit-driven information management system (collecting information in the form of relevant technical-physical parameters (data) and processing them for benefit-driven use in the respective product system). These concepts will be based on current technical solutions and the basics of control engineering In addition, trends in fundamental development and emerging solutions from information technology will also be taken into consideration.

The concept of sustainability and principles for taking it into account in product development.
The notion of "planned obsolescence" and its impact on efforts to achieve sustainability.

[*updated 04.11.2020*]

Teaching methods/Media: Seminaristic, interactive instruction. The project will be carried out according to an annually updated guideline (specification sheet), that will be available at the beginning of the course. The project will be monitored in regular meetings. It should preferably be carried out in teams in order to use and master group dynamic processes and procedures. [*updated 04.11.2020*]
Recommended or required reading: Pahl/Beitz: Konstruktionslehre - Methoden und Anwendung erfolgreicher Produktentwicklung. Springer Vieweg, Heidelberg. Pahl/Beitz: Engineering Design - A Systematic Approach. Springer-Verlag, London. Ehrlenspiel, K.; Meerkamm, H.: Integrierte Produktentwicklung - Denkabläufe, Methodeneinsatz, Zusammenarbeit. Carl Hanser Verlag, München. Herstatt, C.; Sander, J.: Produktentwicklung mit virtuellen Communities. Gabler-Verlag. Vajna, S.: Integrated Design Engineering: Ein interdisziplinäres Modell für die ganzheitliche Produktentwicklung. Springer Verlag. Engeln, W.: Produktentwicklung - Herausforderungen, Organisation, Prozesse, Methoden und Projekte. Vulkan-Verlag. Scholz, U.; Pastoors, S.; Becker, J.; Daniela Hofmann, D.; Van Dun, R.: Praxishandbuch Nachhaltige Produktentwicklung. Spinger-Verlag. Zimmerer, C.: Nachhaltige Produktentwicklung: Integration der Nachhaltigkeit in den Produktentstehungsprozess. Disserta-Verlag. [*updated 04.11.2020*]

Legislation and Regulation

Module name (EN): Legislation and Regulation
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_A_1.03.RER
Hours per semester week / Teaching method: 3V+1U (4 hours per week)
ECTS credits: 5
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Written exam 90 min.

[*updated 04.11.2020*]

Applicability / Curricular relevance:

DFMME-111 (P610-0444) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 1, mandatory course
MAM_19_A_1.03.RER (P241-0085) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Studienleitung

Lecturer:
Daniel Kelkel, M.Sc.
Dipl.-Ing. Friedbert Theis

[*updated 18.11.2022*]

Learning outcomes:
EU regulations for product development and industrial production - 2 hours per semester week:
After successfully completing this module, students will be familiar with the practical implementation of European product directives (especially the machinery directive) in the European Economic Area.
They will be able to carry out conformity assessment procedures including the CE marking of products.
Students will be familiar with the legal consequences of putting defective products on the market or exhibiting them, as well as the legal consequences of defective products that have caused personal injury or damage to property.

Occupational health and safety law - 2 hours per semester week:
After successfully completing this module, students will be familiar with the legal system of occupational health and safety and the application of relevant statutory provisions. They will be familiar with occupational health and safety as an integral part of a holistically-oriented corporate strategy and will be able to assess the consequences of responsibility and liability in the area of occupational health and safety in professional practice.

[*updated 04.11.2020*]

Module content:

EU regulations for product development and industrial production - 2 hours per semester week:
1. EU law (basic principles)
2. Implementation of European product directives into national law
3. European Economic Area (EEA)
4. Basic requirements of the EU Machinery Directive
5. Essential health and safety requirements
6. Harmonized standards and presumption of conformity
7. Requirements of applicable directives
8. Risk management
9. Technical documentation as defined by EU law
10. Operating instructions
11. Conformity assessment procedures
12. Declaration of conformity / Declaration of incorporation
13. CE marking
14. Legal consequences

Occupational health and safety law - 2 hours per semester week:
1. Legal framework
2. EU law / national law (legal classification)
3. Basic employer obligations
4. Delegation of responsibility to managers
5. Responsibility and liability in occupational health and safety
6. Technical occupational health and safety
  - Act on the Implementation of Measures of Occupational Safety and Health to Encourage Improvements in the Safety and Health Protection of Workers at Work (Arbeitsschutzgesetz, ArbSchG)
  - German Social Code VII (Sozialgesetzbuch VII)
  - Industrial safety regulations (Betriebssicherheitsverordnung)
  - Occupational Safety Directive on Noise and Vibration (Lärm- und Vibrations-Arbeitsschutzverordnung)
  - Occupational Safety and Health Ordinance on Artificial Optical Radiation (Arbeitsschutzverordnung zu künstlicher optischer Strahlung)
  - Occupational Health and Safety Ordinance on Electromagnetic Fields (Arbeitsschutzverordnung zu elektromagnetischen Feldern)
  - Workplaces Ordinance (Arbeitsstättenverordnung)
  - Construction Site Ordinance (Baustellenverordnung)
7. Occupational health and safety with regard to materials
  - Chemicals Act
  - Hazardous Substances Ordinance
  - Biological Agents Ordinance
  - Genetic Engineering Act
  - Explosives Act
8. Occupational Health and Safety Organization
  - Occupational Health and Safety Act (Arbeitssicherheitsgesetz)
  - Works Constitution Act (Betriebsverfassungsgesetz)
9. Social occupational health and safety
  - Working Time Act (Arbeitszeitgesetz)
  - Maternity Protection Act (Mutterschutzgesetz)
  - Youth Employment Protection Act (Jugendarbeitsschutzgesetz)
  - Law concerning driving personnel (Fahrpersonalgesetz)
10. Medical occupational safety
  - Occupational Diseases Ordinance
  - Ordinance on occupational health precautions (Verordnung zur arbeitsmedizinischen Vorsorge)
  - Accident Insurance Notification Ordinance (Unfallversicherungs-Anzeigeverordnung)
11. Dual system in occupational health and safety supervision

[*updated 04.11.2020*]

Recommended or required reading:
EU regulations for product development and industrial production
Machinery Directive
Low Voltage Directive
EMC Directive
Equipment and Product Safety Act with regulations

Occupational health and safety law:
Kahl: Arbeitssicherheit
Schliephacke: Führungswissen Arbeitssicherheit

[*updated 04.11.2020*]

Master Thesis (with Research Colloquium)

Module name (EN): Master Thesis (with Research Colloquium)

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_A_4.01.MAK

Hours per semester week / Teaching method:
-

ECTS credits:
30

Semester: 4

Mandatory course: yes

Language of instruction:
German

Assessment:
Paper and presentation

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_A_4.01.MAK (T241-0064) Engineering and Management, Master, ASPO 01.10.2019 , semester 4, mandatory course

Workload: The total student study time for this course is 900 hours.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Studienleitung
Lecturer: Professoren der Fakultät Professoren HTW   [*updated 24.04.2019*]
Learning outcomes: After successfully completing this module, students will be able to work on a complex problem/topic from the fields of development and/or research independently and in a structured manner using (engineering) scientific methods and tools within a given period of time and to produce a result. They will be able to apply their knowledge in a targeted manner and expand it in a goal-oriented manner. Students will be able to document and present their approach and result in a structured and concise form in a documentation (term paper) and to present and defend it in a lecture to an audience of experts. [*updated 04.11.2020*]
Module content: Topic-specific. The selected topic/problem is characterized by a higher level of complexity. The Master´s thesis can be carried out in cooperation with a commercial enterprise or research institution or within the framework of a research project in the faculty. Students should apply and develop their knowledge and skills within the framework of their Master´s thesis. The thesis can be written in a foreign language in consultation with the thesis supervisor. Students are granted a maximum of 6 months to write their thesis. [*updated 04.11.2020*]
Recommended or required reading: [*still undocumented*]

Meetings, Negotiating and Intercultural Communication

Module name (EN): Meetings, Negotiating and Intercultural Communication
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_A_2.01.MNI
Hours per semester week / Teaching method:

2S (2 hours per week)

ECTS credits:
2

Semester: 2

Mandatory course: yes

Language of instruction:
English/German

Assessment:
Written exam 120 min.

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_A_2.01.MNI (P241-0065) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
MAM_19_A_3.02.RWP Reading, Writing and Presenting for Academic Purposes

[*updated 18.02.2020*]

Module coordinator:
Prof. Dr. Christine Sick

Lecturer: Prof. Dr. Christine Sick

[*updated 21.03.2019*]

Learning outcomes:
After successfully completing this module, students will have consolidated and expanded their job-related language and expression skills at level B2 of the Common European Framework of Reference for Languages acquired in the course of their Bachelor´s degree.
Through integrated training of the four basic skills of listening comprehension, reading comprehension, speaking and writing, this course consolidates skills and knowledge in the areas of pragmatics, lexis and grammar at a higher level using selected situations and topics that are relevant to the students and their future professional field.
Particular emphasis will be placed on successfully conducting negotiations and participating in and managing meetings in an intercultural context.

[*updated 04.11.2020*]

Module content:
The curriculum, that is continuously being revised and adapted to the needs of the economy and the requirements of the students, includes the following main points:

- How good are your business manners?
- Intercultural communication in business
- Case studies
- Dealing with difficult situations (critical incidents)
- Negotiating a contract (Writing and understanding quotations and formal business letters/e-mails in general; negotiating a contract face to face, on the telephone and virtually)
- Preparing a meeting (scheduling a meeting, agenda)
- Introductions and greetings
- Small talk
- Chairing a meeting
- Taking part in a meeting

Functional language:
- Polite language
- Expressing an opinion
- Agreeing and disagreeing
- Suggesting
- Giving, accepting, asking for advice
- Criticizing
- Repairing, compensating, explaining
- Metacommunication: Talking about what we mean

[*updated 04.11.2020*]

Teaching methods/Media:
Teaching methods:
The learning goals will be achieved through integrated training of the four basic skills (listening comprehension, reading comprehension, speaking and writing) supported by multimedia, as well as the repetition of basic grammar and vocabulary in self-study phases.

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

[*updated 04.11.2020*]

Recommended or required reading:
Students will receive a list of recommended teaching and learning materials.

The following materials are free of charge for students of the htw saar. We recommend their use for independent learning:

- Christine Sick, unter Mitarbeit von Miriam Lange (2011): TechnoPlus English 2.0. Ein multimediales Sprachlernprogramm für Technisches Englisch und Business English. CD-ROM. EUROKEY.

Christine Sick (2015): TechnoPlus Englisch VocabApp (Mobile-Learning-Angebot insbesondere zum Grundwortschatz, alle Niveaustufen), EUROKEY.

[*updated 04.11.2020*]

Motion Control Technology

Module name (EN): Motion Control Technology
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_PE_2.05.BWT
Hours per semester week / Teaching method: 3V+2P (5 hours per week)
ECTS credits: 5
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Written exam 120 min. Lab project [*updated 04.11.2020*]
Applicability / Curricular relevance: DFMME-2b2 (P610-0451) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Product Development MAM_19_PE_2.05.BWT (P241-0013, P241-0014) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Product Development
Workload: 75 class hours (= 56.25 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 93.75 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Andrea Bohn
Lecturer: Prof. Dr. Andrea Bohn

[*updated 21.03.2019*]

Learning outcomes:
After successfully completing this module, students will be able to generate the motions of working organs, tools and processed goods under consideration of technological requirements and to optimize them with regard to various criteria (acceleration, driving forces, vibration behavior). They will be able to design (mechatronic) solutions for the implementation of given motions, record their characteristics and estimate the limits of their application. They will be able to select the appropriate calculation model for the respective phase of the development process and to implement it with the aid of analytical approaches or by using the FMD software RECURDYN.

[*updated 04.11.2020*]

Module content:
Lecture:
1. Introduction
2. Motion design
 2.1 The basics
 2.2 Describing motion sequences for transmission tasks
 2.3 Describing motion sequences for guidance tasks
3. Modeling motion systems
 3.1 Classification in the development process
 3.2 Rigid body model
 3.3 Kinetoelastic model
 3.4 Oscillatory motion model
 3.5 Introduction to multibody simulation
4. Designing motion systems
 (Case studies and exercises for the design and optimization of motion systems, taking into account design effort, necessary driving forces, required energy input)

Computer lab:
- Introduction to the mutlibody dynamics software program RECURDYN
- Tasks for the analysis and synthesis of motion systems

Lab work:
- Exercises on the design and layout of motion systems on laboratory test benches

[*updated 04.11.2020*]

Teaching methods/Media:
Lectures with integrated exercises, practical computer/lab course, lecture notes, exercises, laboratory test rigs with real transmission assemblies

[*updated 04.11.2020*]

Recommended or required reading:
/1/ Fricke, A.; Günzel, D.; Schaeffer, T.: Bewegungstechnik _ Konzipieren und Auslegen von mechanischen Getrieben. 2., überarbeitete Auflage. München: Carl Hanser Verlag. 2019
/2/ Rill, G.; Schaeffer, T.: Grundlagen und Methodik der Mehrkörpersimulation. 2. Auflage. Wiesbaden: Springer Vieweg+Teubner. 2014
/3/ Dresig, H.; Vul_fson, I.I.: Dynamik der Mechanismen. Wien: Springer-Verlag. 2013

[*updated 04.11.2020*]

Plant Engineering and Component Selection

Module name (EN): Plant Engineering and Component Selection
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_V_2.07.ATK
Hours per semester week / Teaching method: 4SU+2PA (6 hours per week)
ECTS credits: 6
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Oral examination 20 min. [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_V_2.07.ATK (P241-0008) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Process Engineering
Workload: 90 class hours (= 67.5 clock hours) over a 15-week period. The total student study time is 180 hours (equivalent to 6 ECTS credits). There are therefore 112.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Matthias Faust
Lecturer: Prof. Dr. Matthias Faust (seminar lesson) Prof. Dr.-Ing. Michael Sauer, M.Sc. (seminar lesson)   [*updated 11.07.2022*]

Learning outcomes:
After successfully completing this module, students will be familiar with the various components and be able to assemble systems from them and design them in accordance with relevant regulations.

Students will understand, be able to explain and roughly calculate selected basic operations in process engineering and its apparatuses, as well as to perform simple modelling on the basis of physical relationships.

[*updated 04.11.2020*]

Module content:
Plant components and their operating behavior, for example:
Piping
(Pressure stages, flange systems, material, cleanability/cleaning systems (CIP/molch), corrosion behavior, pipe forces, processing methods, calculation of pressure loss)
Pipe connection systems
Tanks
Static and dynamic pipe sealing systems, apparatus, pumps and valves
Pump design, and various special designs (hermetically sealed motors, magnetic coupling)
Fields of application and valve design
Heat exchangers

Design guidelines, legal requirements and calculation methods
for planning process plants, e.g:
Pressure Equipment Directive
Surge pressure calculations
Machinery Directive
Risk assessment
Flow diagrams for process engineering plants

Selected basic operations,
their principles and apparatuses, for e.g:
Removing particles > 30µm, sedimentation, cycloning, coarse filtration
Removing particles

[*updated 04.11.2020*]

Teaching methods/Media:
Lecture with tutorials, lecture guide
Exercises for the lecture, worksheet exercises and presentations
Slide handouts in electronic form
Seminaristic instruction and lab exercises

[*updated 04.11.2020*]

Recommended or required reading:
Bernecker Gerhard, Planung und Bau verfahrenstechnischer Anlagen 2001; Ullrich, Hansjürgen, Wirtschaftliche Planung und Abwicklung verfahrenstechnischer Anlagen 1996, VDI; Auftragsabwicklung im Maschinen- und Anlagenbau 1991; Hirschberg, Hans Günther, Verfahrenstechnik und Anlagenbau 1999; Wagner, Walter, Planung im Anlagenbau 1998; Rautenbach, Robert, Anlagenplanung, Prozess Design 1992; Frank P. Helmus, Anlagenplanung von der Anfrage bis zur Abnahme, Wiley-VCH Weinheim 2003; Walter Wagner, Planung im Anlagenbau, Vogel-Verlag 2018; Kreiselpumpen, Handbuch für Entwicklung,

Anlagenplanung und Betrieb,Springer Vieweg 2014;

[*updated 04.11.2020*]

Product Development Using New Material Concepts

Module name (EN): Product Development Using New Material Concepts
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_PE_2.06.PEW
Hours per semester week / Teaching method: 4V+2PA (6 hours per week)
ECTS credits: 8
Semester: 2
Mandatory course: yes
Language of instruction: German
Assessment: Project with documentation and final presentation [*updated 04.11.2020*]
Applicability / Curricular relevance: DFMME-2b3 (P610-0452) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Product Development MAM_19_PE_2.06.PEW (P241-0067) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Product Development
Workload: 90 class hours (= 67.5 clock hours) over a 15-week period. The total student study time is 240 hours (equivalent to 8 ECTS credits). There are therefore 172.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: MAM2.1.3.24 [*updated 23.08.2021*]

Module coordinator:
Prof. Dr. Bernd Heidemann

Lecturer:
Prof. Dr. Walter Calles
Prof. Dr. Bernd Heidemann
Daniel Kelkel, M.Sc.
Prof. Dr.-Ing. habil. Andreas Fricke
M.Eng. Oliver Müller

[*updated 29.07.2020*]

Learning outcomes:
After successfully completing this module, students will be familiar with new material concepts, their technological properties and development potential and will be able to develop and use them.
They will be able to implement product functions with these properties by applying specific design methods.
Students will be able to analyze and optimize their product in terms of safety.
They will be able to assess whether a product falls under the Machinery Directive and determine its hazards.
Students will be able to classify safety engineering terms in the overall context of the Machinery Directive.
They will be able to apply the Machinery Directive and know the scope of a conformity procedure.
They will be familiar with the 3-step method for reducing hazards and will be able to select or develop measures to reduce hazards.
Student will be able to carry out a risk assessment of simple machines and products using harmonized standards.
They will be familiar with the Sistema calculation and can interpret an existing calculation.

[*updated 04.11.2020*]

Module content:
Material concept - Plastics:
technological properties, design and production relevant properties, ecological properties, sustainability.

Selecting materials:
Integration of databases for plastics and metallic and ceramic materials in product development and calculation.

Material concepts created in additive manufacturing processes: technological properties, design and production relevant properties, ecological properties, sustainability.

Material concept - "Other materials" (fibre composites, graphene, current developments in materials technology):
technological properties, design and production relevant properties, ecological properties, sustainability.

Product development and component design with regard to material-specific properties: The principles of integral design methods and the integration of functions versus differential design methods and the separation of functions.

Explanation of terms and delimitations pertaining to product safety and the Machinery Directive.

Legal foundation of the Machinery Directive
Types of hazards
The 3-step method of risk reduction
Risk assessment procedure (risk assessment, evaluation and risk reduction)
The importance of harmonized standards and their application
Documenting a risk assessment
Examples of inherently safe product design
Protective devices: mechanical, control, organizational
Basics of Sistema calculation

[*updated 04.11.2020*]

Teaching methods/Media:
Seminaristic, interactive instruction.

The project will be carried out according to an annually updated guideline (specification sheet), that will be available at the beginning of the course. The project will be monitored in regular meetings.

The project should be carried out in teams in order to use and master group dynamic processes and procedures.

[*updated 04.11.2020*]

Recommended or required reading:
Gunter Erhard: Konstruieren mit Kunststoffen. Hanser-Verlag.
Gottfried Wilhelm Ehrenstein Mit Kunststoffen konstruieren: Eine Einführung. Hanser-Verlag.
Schürmann, Helmut: Konstruieren mit Faser-Kunststoff-Verbunden. Springer-Verlag.
Kurt Moser: Faser-Kunststoff-Verbund. Entwurfs- und Berechnungsgrundlagen. Springer-Verlag.
Andreas Gebhardt: Generative Fertigungsverfahren: Additive Manufacturing und 3D Drucken für Prototyping - Tooling _ Produktion. Hanser-Verlag.
Ian Gibson, David Rosen, Brent Stucker: Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing. Springer-Verlag.
John O. Milewski: Additive Manufacturing of Metals: From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewelry. Springer-Verlag.
Tarek I. Zohdi: Modeling and Simulation of Functionalized Materials for Additive Manufacturing and 3D Printing: Continuous and Discrete Media. Springer-Verlag.
Gries, Thomas, Klopp, Kai (Hrsg.): Füge- und Oberflächentechnologien für Textilien - Verfahren und Anwendungen. Springer-Verlag.
Safety engineering:

Alfred Neudörfer: Konstruieren sicherheitsgerechter Produkte. Springer Berlin Heidelberg.
Marco Einhaus, Florian Lugauer, Christina Häußinger: Arbeitsschutz und Sicherheitstechnik. Hanser Verlag.
Maschinenrichtlinie Richtlinie 2006/42/EG
Volker Krey, Arun Kapoor: Praxisleitfaden Produktsicherheitsrecht. Hanser Verlag.
Bernd Bertsche, Gisbert Lechner: Zuverlässigkeit im Fahrzeug und Maschinenbau. Springer Verlag.

[*updated 04.11.2020*]

Production Systems 1

Module name (EN): Production Systems 1
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_IP_1.09.PS1
Hours per semester week / Teaching method: 1V+2SU+1P (4 hours per week)
ECTS credits: 5
Semester: 1
Mandatory course: yes
Language of instruction: German
Assessment: Written exam 70% (120 min.) Project 30% [*updated 04.11.2020*]
Applicability / Curricular relevance: DFMME-1a2 (P610-0446) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Industrial Production MAM_19_IP_1.09.PS1 (P241-0075, P241-0076) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course, Specialization Industrial Production
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for: MAM_19_IP_2.10.IP2 Industrial Manufacturing 2 MAM_19_IP_3.10.PS3 Production Systems 3 [*updated 06.04.2020*]
Module coordinator: Prof. Dr. Jürgen Griebsch

Lecturer:
Prof. Dr. Jürgen Griebsch

[*updated 06.04.2020*]

Learning outcomes:
After successfully completing this module, students will be familiar with the different components of plants, their mode of operation and their interaction in complex production systems.
Students will be able to adapt, modify and refine their decisions in a process-, product- and project-specific manner.
They will be familiar with the demands of industry with regard to modern production systems and will be able to take these into account in development projects.
Students can orient themselves on the current state of the art and take this into account when designing systems.
Students will be able to work in a team, i.e. create schedules and evaluate resources.
They will be able to organize processes within a project group and also to manage internal and external communication.

[*updated 04.11.2020*]

Module content:
Project content 1:
- Designing production units, so-called Smart Cubes as autonomous production units
- System automation
- Principles of control systems
- Basics of robotics

Basic principles of conceptual design with knowledge of project contents 1 are established, current technical implementations, as well as tendencies and emerging solutions including those from information technology (keyword: open/proprietary systems).

Introduction to risk assessment:
- CE / machine safety, FMEA
- QMS / certification
- Norms, (patents)

[*updated 04.11.2020*]

Recommended or required reading:
Gevatter, Grünhaupt; Handbuch der Mess- und Automatisierungstechnik in der Produktion; Springer Verlag, 2006; ISBN: 978-3-540-21207-2

Overmeyer, L.; Steuerungstechnik _ Eine praxisnahe Einführung; Springer Verlag, 2020; ISBN 978-3-540-36043-8

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

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

Jakoby, W.; Qualitätsmanagement für Ingenieure _ Ein praxisnahes Lehrbuch für die Planung und Steuerung von Qualitätsprozessen; Springer Verlag, 2019; ISBN: 978-3-658-26595-3

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

[*updated 04.11.2020*]

Production Systems 2

Module name (EN): Production Systems 2

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_IP_2.11.PS2

Hours per semester week / Teaching method:
5PA (5 hours per week)

ECTS credits:
8

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Project work

[*updated 04.11.2020*]

Applicability / Curricular relevance:

DFMME-2a2 (P610-0449) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Industrial Production
MAM_19_IP_2.11.PS2 (P241-0077) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, mandatory course, Specialization Industrial Production

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 240 hours (equivalent to 8 ECTS credits).
There are therefore 183.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
MAM_19_IP_3.10.PS3 Production Systems 3

[*updated 10.07.2019*]

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer: Prof. Dr. Jürgen Griebsch

[*updated 31.03.2019*]

Learning outcomes:
After successfully completing this module, students will be able to design a plant layout with the following stations for the manufacture of a product: Separating, measuring, force fitting, joining, testing, marking, shipping.
Students will divide the plant layout into individual stations and create one station (Smart Cube) per project group of 4 people (as a rule) in CAD, including a parts list.
They will be able to evaluate which components, parts, etc. should be procured via purchasing (buy) or in-house production (make).
Students will be familiar with the application of the Smart Cube control and selected/applied handling systems.

[*updated 04.11.2020*]

Module content:
They will be able to design the layout for a process sequence for the manufacturing of a product with, as a rule, the following stations:
_ Separating,
_ Measuring
_ Force fitting,
_ Joining,
_ Testing,
_ Marking,
_ Shipping

SMART CUBES project; group-oriented project work with the following tasks:
- Creating a CAD model
- Creation of a parts list including a make-or-buy analysis
- Basics of procurement processes and exemplary applications
- Starting the production of components in the industrial production lab
- Material and information flow
- First independent steps in control (components and programming) and robotics (component handling)

[*updated 04.11.2020*]

Teaching methods/Media:
Seminaristic, interactive instruction.
The "Smart Cubes" project is based on a project handbook that is prepared at the beginning of the course and continuously subject to a target-performance comparison. This will take place in regular workshops with all students or group-specific.

The project will be carried out in teams in order to strengthen social skills, as well as methodological and personal competence.

[*updated 04.11.2020*]

Recommended or required reading:

Westkämper, Engelbert / Warnecke, Hans-Jürgen; "Einführung in die Fertigungstechnik"

Habenicht, Gerd; "Kleben - erfolgreich und fehlerfrei - Handwerk, Praktiker, Ausbildung, Industrie"

Ralf Berning; "Grundlagen der Produktion: Produktionsplanung und Beschaffungsmanagement (Taschenbuch)"

Pahl/Beitz: Engineering Design - A Systematic Approach. Springer-Verlag, London.

Ehrlenspiel, K.; Meerkamm, H.: Integrierte Produktentwicklung - Denkabläufe, Methodeneinsatz, Zusammenarbeit. Carl Hanser Verlag, München.

Scholz, U.; Pastoors, S.; Becker, J.; Daniela Hofmann, D.; Van Dun, R.: Praxishandbuch Nachhaltige Produktentwicklung. Spinger-Verlag.

Gevatter, Grünhaupt; Handbuch der Mess- und Automatisierungstechnik in der Produktion; Springer Verlag, 2006; ISBN: 978-3-540-21207-2

Overmeyer, L.; Steuerungstechnik _ Eine praxisnahe Einführung; Springer Verlag, 2020; ISBN 978-3-540-36043-8

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

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

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

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

[*updated 04.11.2020*]

Production Systems 3

Module name (EN): Production Systems 3

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_IP_3.10.PS3

Hours per semester week / Teaching method:
5PA (5 hours per week)

ECTS credits:
7

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Project work 100%

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_IP_3.10.PS3 (P241-0078) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course, Specialization Industrial Production

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 210 hours (equivalent to 7 ECTS credits).
There are therefore 153.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
MAM_19_IP_1.08.IP1 Industrial Manufacturing 1
MAM_19_IP_1.09.PS1 Production Systems 1
MAM_19_IP_2.10.IP2 Industrial Manufacturing 2
MAM_19_IP_2.11.PS2 Production Systems 2

[*updated 10.07.2019*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer:
Prof. Dr. Jürgen Griebsch

[*updated 07.05.2019*]

Learning outcomes:
After successfully completing this submodule, students will have learned to complete a complex, interdisciplinary project with requirement specifications, a time schedule and a fixed submission/completion date with regard to technical, economic and legal constraints.
Students will have learned to prioritize and make timely decisions with limited resources (personnel, machinery, finances).
They will be able to ensure the success of a project through internal and external communication.
Students will be able to orient themselves on the market, i.e. to assess the market potential and implement a

suitable solution.

[*updated 04.11.2020*]

Module content:
SMART CUBES project; practical implementation of preliminary work and the completion of the project including functional tests and optimization measures.

In detail, the following tasks must be prepared and carried out:
- Structure/organization
- Interfaces
- Functional testing
- Test
- Documentation
- Marketing

[*updated 04.11.2020*]

Teaching methods/Media:
Seminaristic, interactive instruction.
The "Smart Cubes" project is based on a project handbook that is prepared at the beginning of the course and continuously subject to a target-performance comparison. This will take place in regular workshops with all students or group-specific.

The project will be carried out in teams in order to strengthen social skills, as well as methodological and personal competence.

[*updated 04.11.2020*]

Recommended or required reading:
Recommended or required reading:
Westkämper, Engelbert / Warnecke, Hans-Jürgen; "Einführung in die Fertigungstechnik"

Habenicht, Gerd; "Kleben - erfolgreich und fehlerfrei - Handwerk, Praktiker, Ausbildung, Industrie"

Ralf Berning; "Grundlagen der Produktion: Produktionsplanung und Beschaffungsmanagement (Taschenbuch)"

Pahl/Beitz: Engineering Design - A Systematic Approach. Springer-Verlag, London.

Ehrlenspiel, K.; Meerkamm, H.: Integrierte Produktentwicklung - Denkabläufe, Methodeneinsatz, Zusammenarbeit. Carl Hanser Verlag, München.

Scholz, U.; Pastoors, S.; Becker, J.; Daniela Hofmann, D.; Van Dun, R.: Praxishandbuch Nachhaltige Produktentwicklung. Spinger-Verlag.

Gevatter, Grünhaupt; Handbuch der Mess- und Automatisierungstechnik in der Produktion; Springer Verlag, 2006; ISBN: 978-3-540-21207-2

Overmeyer, L.; Steuerungstechnik _ Eine praxisnahe Einführung; Springer Verlag, 2020; ISBN 978-3-540-36043-8

Haun, M.; Handbuch Robotik _ Programmieren und Einsatz intelligenter Roboter, Springer Verlag 2013;

ISBN 978-3-642-39858-2

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

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

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

[*updated 04.11.2020*]

Production-Oriented Corporate Management

Module name (EN): Production-Oriented Corporate Management

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_M_3.05.POU

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

ECTS credits:
5

Semester: 3

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 120 min.
Seminar presentation

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_M_3.05.POU (P241-0073, P241-0074) Engineering and Management, Master, ASPO 01.10.2019
, semester 3, mandatory course

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Andrea Bohn

Lecturer:
Prof. Dr. Ralf Oetinger

[*updated 16.02.2024*]

Learning outcomes:
After successfully completing this module, student will have acquired process knowledge with regard to product development, production control and much more. They will be familiar with the necessary data and be capable of compiling and managing this information in an ERP system. Students will form groups to solve case studies.

The focus will be on the cooperation between specialized departments in a company. Technical and administrative business processes will be used to show how the cooperation between commercial and technical departments leads to product development. Practical examples and case studies using an ERP system (mySAP) will deepen the understanding of the material.

[*updated 04.11.2020*]

Module content:
1.Manufacturing companies in global competition - Overview

2.Production management
  5.Product life cycle
  b.Production structures (BOMs, routings, work centers)
  c.Product Data Management (PDM)
  d.Processes within the framework of product development
  e.Production scheduling
  f.Scheduling and capacity planning
  g.Manufacturing control

3.Introduction to the use of ERP systems based on case studies.
  Case study: Selected business processes from production planning and control in ERP systems (mySAP)
Lecture with exercises, short student presentations, exercises for the lecture

[*updated 04.11.2020*]

Recommended or required reading:
Oetinger: Lecture notes for the lecture "Produktionsorientierte Unternehmensführung", 2009
Ebel: Produktionswirtschaft, latest edition.
Lödding: Verfahren der Fertigungssteuerung, 2008.

[*updated 04.11.2020*]

Project Management

Module name (EN): Project Management

Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_V_3.08.PRM
Hours per semester week / Teaching method: 4V (4 hours per week)
ECTS credits: 5
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: Oral exam 20 min. Term paper [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_V_3.08.PRM (P241-0081, P241-0082) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course, Specialization Process Engineering
Workload: 60 class hours (= 45 clock hours) over a 15-week period. The total student study time is 150 hours (equivalent to 5 ECTS credits). There are therefore 105 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Matthias Faust
Lecturer: Prof. Dr. Matthias Faust   [*updated 11.07.2022*]
Learning outcomes: After successfully completing this module, students will be familiar with essential and advanced methods of project management and will be able to explain and apply them. [*updated 19.05.2023*]

Module content:

Presentation of a project;

Outline of typical companies in the chemical/pharmaceutical industry, strategic planning;

Brainstorming methods; team building methods, team roles; goals and setting goals; motivators; hygiene factors; leadership styles and their appropriateness; techniques and methods of facilitation, communication in the project, conversation and negotiation, negotiating, countering killer phrases; conflict management; levels of communication, non-verbal communication, body language; giving and receiving feedback; recognizing, evaluating and resolving conflicts; personnel discussions; tasks of modern management; conducting conversations; time management; cost management;

Project types, facility design, project phasing, design phases, execution, commissioning, closeout, documentation and monitoring; determining costs and pricing;

Roles of scientists, engineers, plant engineers, customers, and operators, tracking project costs, business plan, resource planning and tracking; project program, project portfolio, project structure, sequence, and schedule, multi-project management, international projects, critical path identification and tracking, risk assessment;

[*updated 19.05.2023*]

Teaching methods/Media:
Seminaristic lecture, group work, role playing, students talks, talks from industry experts

[*updated 19.05.2023*]

Recommended or required reading:
G. Patzak, G. Rattay, Projektmanagement: Leitfaden zum Management von Projekten, Projektportfolios und projektorientierten Unternehmen, Linde, 2014.
H. Zell, Projektmanagement - Lernen, Lehren und für die Praxis, 2013.

[*updated 19.05.2023*]

Reading, Writing and Presenting for Academic Purposes

Module name (EN): Reading, Writing and Presenting for Academic Purposes

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_A_3.02.RWP

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

ECTS credits:
2

Semester: 3

Mandatory course: yes

Language of instruction:
English/German

Assessment:
Composition + presentation

[*updated 04.11.2020*]

Applicability / Curricular relevance:

MAM_19_A_3.02.RWP (P241-0083, P241-0084) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course

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

Recommended prerequisites (modules):
MAM_19_A_2.01.MNI Meetings, Negotiating and Intercultural Communication

[*updated 18.02.2020*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Christine Sick

Lecturer:
Sebastian Barth, M.A.

[*updated 18.02.2020*]

Learning outcomes:
On the basis of the knowledge acquired in the mandatory Bachelor modules, this module focuses on the written and oral presentation of engineering project results. The present module is based on the technical content of the research and development project from the 3rd semester of the Engineering and Management master program
After successfully completing this module, students will be able to understand demanding and complex texts on mechanical engineering related topics by applying reading strategies.
They will be familiar with the structures of scientific material and be able to use these when writing a short scientific article in English.
Furthermore, students will be able to effectively use the advanced presentation techniques they have learned when presenting their project results orally in English.

[*updated 04.11.2020*]

Module content:
The content is geared to specific tasks in close coordination with representatives from the technical subjects dealt with in the project:

_ Advanced reading strategies

_ Reading and summarizing technical texts
_ Developing special topics using authentic technical texts, videos, etc.

_ Describing engineering-related scientific connections
_ Describing cause-and-effect relationships

_ Introduction to academic writing (text types, form, structure, language requirements)
_ Writing strategies and linguistic means of academic writing
_ Writing a short scientific article

_ Structure of and useful phrases in English presentations
_ Describing graphics and tables
_ Practice presentations
_ Presentation slides, posters
_ Discussion techniques (useful phrases and intercultural skills)
_ Grammar, as required

[*updated 04.11.2020*]

Teaching methods/Media:
Teaching methods:
The learning goals will be achieved through integrated training of the four basic skills (listening comprehension, reading comprehension, speaking and writing) supported by multimedia, as well as the repetition of basic grammar and vocabulary in self-study phases.

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

[*updated 04.11.2020*]

Recommended or required reading:
Students will receive a list of recommended teaching and learning materials.

The following materials are free of charge for students of the htw saar. We recommend their use for independent learning:

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

Christine Sick, unter Mitarbeit von Lisa Rauhoff und Miriam Wedig (seit 2016): Online Extensions zu TechnoPlus Englisch,

Christine Sick (2015): htw saar TechnoPlus Englisch VocabApp (Mobile Learning Angebot insbesondere zum Grundwortschatz, alle Niveaustufen), EUROKEY.

Authentic technical texts and videos
In consultation with the respective project colleagues.

[*updated 04.11.2020*]

Research and Development

Module name (EN): Research and Development
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_A_3.01.FEP
Hours per semester week / Teaching method: 2PA (2 hours per week)
ECTS credits: 10
Semester: 3
Mandatory course: yes
Language of instruction: German
Assessment: Paper and presentation [*updated 04.11.2020*]
Applicability / Curricular relevance: MAM_19_A_3.01.FEP (P241-0045) Engineering and Management, Master, ASPO 01.10.2019 , semester 3, mandatory course
Workload: 30 class hours (= 22.5 clock hours) over a 15-week period. The total student study time is 300 hours (equivalent to 10 ECTS credits). There are therefore 277.5 hours available for class preparation and follow-up work and exam preparation.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Studienleitung
Lecturer: Professoren der Fakultät Professoren HTW [*updated 18.02.2020*]

Learning outcomes:
After successfully completing this module, students will be able to independently develop structured results (solutions) for a (engineering) problem from the fields of development and/or research.

[*updated 04.11.2020*]

Module content:
Topic-specific
The research and development project can cover various topics from research and practice within or outside the htw.
Students can work in a group or alone.

[*updated 04.11.2020*]

Teaching methods/Media:
Project work, also possible in a team.

[*updated 04.11.2020*]

Recommended or required reading:
Topic-dependent

[*updated 04.11.2020*]

The Statistics and Theory of Numerical Simulation

Module name (EN): The Statistics and Theory of Numerical Simulation

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_A_1.01.MTS

Hours per semester week / Teaching method:
5V+3U (8 hours per week)

ECTS credits:
8

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam 120 min.

[*updated 04.11.2020*]

Applicability / Curricular relevance:

DFMME-110 (P610-0443) Mechanical Engineering, Master, ASPO 01.10.2019 , semester 1, mandatory course
MAM_19_A_1.01.MTS (P241-0088) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course

Workload:
120 class hours (= 90 clock hours) over a 15-week period.
The total student study time is 240 hours (equivalent to 8 ECTS credits).
There are therefore 150 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
MAM_19_M_3.03.ASF Applied Numerical Simulations (Fluid Mechanics / Heat Transport)
MAM_19_PE_2.04.SHY Hydraulic Servo-Motors
MAM.2.1.2.29 Experiment Design and Quality Control

[*updated 08.02.2022*]

Module coordinator:
Prof. Dr. Marco Günther

Lecturer: Prof. Dr. Marco Günther

[*updated 21.03.2019*]

Learning outcomes:
Statistics:
After successfully completing this module, students will be able to solve statistical problems in the field of engineering sciences independently. They will be able to prepare and analyse complex data sets and interpret the results. Using suitable estimation methods, they will be able to draw conclusions about the population from a sample and critically scrutinize available statistics or the results of their evaluation.

Simulation Theory
In the context of engineering problems, students will be familiar with the basics of mathematical modeling and numerical methods. They will be familiar with the basic properties of partial differential equations, simple solution methods and know about the possibilities and limitations of numerical methods using the finite difference method.

[*updated 04.11.2020*]

Module content:
Statistics:
- Descriptive statistics: central tendencies and dispersion, correlation, regression
- Probability calculation: random variables und distributions, limit theorems
- Inferential statistics: point estimate, interval estimate, testing hypotheses
- Introduction to a statistics program package

Simulation Theory:
- Fundamentals of vector analysis (repetition)

- Fundamentals of partial differential equations (e.g. classification)
- Basic concepts of numerics like stability, convergence, error
- Solution methods: separable partial differential equation, Finite Differences Method (FDM)
- Applying the FDM to boundary value problems and initial boundary value problems
- Using Comsol Multiphysics as a solution tool

[*updated 04.11.2020*]

Teaching methods/Media:
Statistics:
Lecture: 3 hours per semester week, tutorials: 2 hours per semester week,
Use of the web-based learning software ActiveMath:
http://markov.htw-saarland.de:8080/ActiveMath2/main/menu.cmd,

Simulation Theory:
Lecture: 2 hours per semester week, Tutorials: 1 hour per semester week,
Blackboard, slides, handouts, tutorials

[*updated 04.11.2020*]

Recommended or required reading:
Statistics:
Weber H.: Einführung in die Wahrscheinlichkeit und Statistik für Ingenieure
Hartung J., Elpelt B.: Multivariate Statistik
Walz G., Grabowski B.: Lexikon der Stochastik mit Beispielen
Lecture notes _Deskriptive Statistik_, und Formelsammlung 1
Lecture notes _Wahrscheinlichkeitsrechnung_ und Formelsammlung 2

Simulation Theory:
Angermann A., Beuschel M, Rau M., Wohlfarth U.: MATLAB _ Simulink _ Stateflow
Knabner P., Angermann L.: Numerik partieller Differentialgleichungen

[*updated 04.11.2020*]

Engineering and Management Master - optional courses

Current Methods in Molecular and Microbiology

Module name (EN): Current Methods in Molecular and Microbiology

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM.2.1.6.20

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

ECTS credits:
3

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:
Exam

[*updated 08.01.2024*]

Applicability / Curricular relevance:

BMT2512.MBIO (P213-0156) Biomedical Engineering, Bachelor, ASPO 01.10.2018 , optional course, medical/technical, course inactive since 06.09.2022
BMT1932 (P213-0156, P213-0164) Biomedical Engineering, Master, ASPO 01.04.2014 , optional course, general subject
MAM.2.1.6.20 Engineering and Management, Master, ASPO 01.10.2019 , optional course, general subject
MP2208.MBIO (P213-0156) Medical Physics, Master, ASPO 01.04.2019 , semester 2, optional course, medical/technical

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Timo Gehring

Lecturer: Prof. Dr. Timo Gehring

[*updated 15.10.2021*]

Learning outcomes:
After successfully completing this course, students will have significantly increased their knowledge in molecular biology, microbiology and hygiene. They will be proficient in the molecular biological methods currently used in clinical practice and research that enable a better understanding of modern medical diagnostic procedures and biotechnological processes.
Students will be familiar with the most important pathogenic bacteria and viruses, as well as antibiotics and the growing problem of antibiotic resistance. They will be able to assess which disinfection and sterilisation procedures should be used and when. They will be familiar with biotechnological processes and be able to cultivate the algae that also play a role in the pharmacological field.

[*updated 08.01.2024*]

Module content:
Basics of molecular biology
Current molecular biological and microbiological methods used for clinical diagnosis and in biotechnology.
Molecular biological methods:
Polymerase Chain Reaction (PCR)
DNA-modifying methods (e.g. restriction digestion, CRISPR-CAS, detailed implementation of cloning)
Southern blot analyses, DNA microarray and chip technology
DNA sequencing (Sanger method and Next Generation Sequencing)

Micro-biological procedures
Medical microbiology (pathogenic bacteria, viruses and others)
Hospital infections
Antibiotics and development of resistance against antibiotics
Desinfection and sterilization
Photosynthesis and the use of algae in biotechnology

Safety seminar for the practical course
Use of the following molecular biological/biotechnological methods in the practical course:
Isolating DNA from various algae (cyanobacteria)
Amplification of 16S rDNA of these cyanobacteria by PCR
DNA gel electrophoresis

[*updated 08.01.2024*]

Teaching methods/Media:
Video projector, Powerpoint presentation, lab experiments

[*updated 08.01.2024*]

Recommended or required reading:
Biochemie - H.R. Horton, L.A. Moran, K.G. Scrimgeour, M.D. Perry, J.D. Rawn.
Brock Mikrobiologie - M.T. Madigan, J.M. Martinko.
Hygiene und medizinische Mikrobiologie - M. Dülligen, A. Kirov, H. Unverricht.

[*updated 08.01.2024*]

Experiment Design and Quality Control

Module name (EN): Experiment Design and Quality Control

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM.2.1.2.29

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

ECTS credits:
3

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:
Composition

[*updated 04.11.2020*]

Applicability / Curricular relevance:

FTM-VUQ Automotive Engineering, Master, ASPO 01.04.2021 , optional course, technical
FTM-VUQ Automotive Engineering, Master, ASPO 01.04.2023 , optional course, technical
MAM.2.1.2.29 (P241-0367) Engineering and Management, Master, ASPO 01.10.2019 , optional course, technical

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

Recommended prerequisites (modules):
MAM_19_A_1.01.MTS The Statistics and Theory of Numerical Simulation

[*updated 08.02.2022*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Gerald Kroisandt

Lecturer:
Prof. Dr. Gerald Kroisandt

[*updated 08.02.2022*]

Learning outcomes:
After successfully completing this module and based on the statistical knowledge they acquired in MAM_19_A_1.01.MTS, students will be able to determine confidence intervals for a wide range of mean values and variances. They will also understand how process control charts work.
Students will understand tests, and in particular how to proceed when choosing a hypothesis and an alternative.

As with confidence intervals, they will be able to design appropriate tests for a wide range of situations.
If something depends on several factors, e.g. the load capacity of a component, students will be familiar with common methods for designing experiments and will be able to apply them.

The question as to which factor(s) produce differences in quality is examined by analysis of variance, which students will also be able to apply.

- Point estimator (ML estimator) and mean-squared error for quality assessment

[*updated 04.11.2020*]

Module content:

- Confidence intervals for diverse situtaions
- Basics of process control charts
- Hypothesis testing for different situations
- Designing experiments
- Analysis of variance

[*updated 04.11.2020*]

Recommended or required reading:

[*still undocumented*]

Labor Law

Module name (EN): Labor Law

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_2.2.24

Hours per semester week / Teaching method:
-

ECTS credits:
2

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 23.11.2020*]

Applicability / Curricular relevance:

FTM-ARBR (P241-0373) Automotive Engineering, Master, ASPO 01.04.2021 , optional course, management
FTM-ARBR (P241-0373) Automotive Engineering, Master, ASPO 01.04.2023 , optional course, management, course inactive since 08.01.2024

MAM_19_2.2.24 (P241-0373) Engineering and Management, Master, ASPO 01.10.2019 , optional course, management
Workload: The total student study time for this course is 60 hours.
Recommended prerequisites (modules): None.
Recommended as prerequisite for:
Module coordinator: Prof. Dr. Ralf Oetinger
Lecturer: Ass.-Jur. Jana Harwart [*updated 03.09.2020*]
Learning outcomes: [*still undocumented*]
Module content: [*still undocumented*]
Recommended or required reading: [*still undocumented*]

Membranes and Membrane Processes

Module name (EN): Membranes and Membrane Processes
Degree programme: Engineering and Management, Master, ASPO 01.10.2019
Module code: MAM_19_2.2.25
Hours per semester week / Teaching method: 2SU (2 hours per week)
ECTS credits: 3
Semester: 2
Mandatory course: no

Language of instruction:
German

Assessment:

[*updated 08.05.2023*]

Applicability / Curricular relevance:

MAM_19_2.2.25 (P241-0407) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, optional course

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Matthias Faust

Lecturer:
Prof. Dr. Matthias Faust

[*updated 13.02.2023*]

Learning outcomes:
After successfully completing this course, students will be able to:
- describe applications for membranes in the chemical/pharmaceutical industry, medical technology and environmental technology.
- name and apply the main membrane types and membrane processes.
- explain the main manufacturing processes for membranes.
- describe characterization methods for membranes.
- calculate and interpret membrane performance data.

[*updated 08.05.2023*]

Module content:
- Fields of application for membrane processes in the chemical/pharmaceutical industry, medical technology and environmental technology
- Microfiltration, ultrafiltration, nanofiltration, dialysis, reverse osmosis
- Membrane materials (ceramics, polymers, composites)
- Membrane manufacturing processes
- Types of membrane modules (capillary modules, flat membranes, tubular modules)
- Mass transfer models for membrane processes
- Fluid dynamics in membrane modules

- Characterization of membranes (structure, morphology, surface chemistry, retention, pore size, ultrafiltration rate, transmembrane pressure) and characterization methods
- Membrane reactors
- Nonwoven membranes (Electrospinning)
- Practical examples from drinking water filtration, waste water treatment, haemodialysis, fuel cell technology
- Study trip

[*updated 08.05.2023*]

Teaching methods/Media:
Lecture with exercises. presentation and study trip(s)

[*updated 28.04.2023*]

Recommended or required reading:
Klaus Ohlrogge, Membranen: Grundlagen, Verfahren und industrielle Anwendungen, Wiley-VCH, 2006.
Thomas Melin, Robert Rautenbach, Membranverfahren: Grundlagen der Modul- und Anlagenauslegung, Springer, 2007.

[*updated 28.04.2023*]

Non-Linear Finite Elements

Module name (EN): Non-Linear Finite Elements

Degree programme: Engineering and Management, Master, ASPO 01.10.2019

Module code: MAM_19_2.2.26

Hours per semester week / Teaching method:
1SU+3PA (4 hours per week)

ECTS credits:
5

Semester: 2

Mandatory course: no

Language of instruction:
German

Assessment:
Project work with composition and presentation

[*updated 27.01.2023*]

Applicability / Curricular relevance:

MAM_19_2.2.26 (P241-0408) Engineering and Management, Master, ASPO 01.10.2019 , semester 2, optional course

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

Recommended prerequisites (modules):
MAM_19_M_1.02.ASM Applied Numerical Simulations (Mechanical Systems)

[*updated 29.03.2022*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Ramona Hoffmann

Lecturer:
Prof. Dr.-Ing. Ramona Hoffmann

[*updated 08.03.2022*]

Learning outcomes:
After successfully completing this module, students will be able to:
-- analyze structural mechanics problems with regard to non-linear effects.
-- describe geometric and material-related non-linearities and to consider their effects in FEM simulations.
-- model contacts in the FEM and perform related calculations.
-- verify the calculation results through analytical counter-calculations and estimations.

[*updated 27.01.2023*]

Module content:
-- Basics of the non-linear finite element method
- Geometric non-linearities
-- Non-linear material behavior (elasto-plasticity, creep (viscoelasticity), hyperelasticity)
-- Contact calculations
-- Analysis and calculation of a problem of the students´ choice

[*updated 27.01.2023*]

Teaching methods/Media:
A practical course is integrated into the module at the computer workstation in the ECC.

[*updated 27.01.2023*]

Recommended or required reading:
-- Klein, B.: FEM Grundlagen und Anwendungen der Finite-Element-Methode im Maschinen- und Fahrzeugbau
-- Wriggers, P.: Nichtlineare Finite-Element-Methoden

-- Rust, W.:Nichtlineare Finite-Elemente-Berechnungen mit ANSYS Workbench

[*updated 27.01.2023*]