Course Handbook Mechanical Engineering Master

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Head of Studies	Prof. Dr.-Ing. Heike Jaeckels
Chairman of Examination	Prof. Dr. techn. Marcel Wiggert
Deputy Chairman of Examination	Prof. Dr. Stefan Selle

Mechanical Engineering Master - mandatory courses (overview)

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
English 1	DFMME-103	P610-0437	1	2VU	2	Dr. Julia Frisch
English 2	DFMME-203	P610-0441	2	2VU	2	Dr. Julia Frisch
French I	DFMME-102	P610-0436	1	4VU	2	Dr. Julia Frisch
French II	DFMME-202	P610-0440	2	4VU	2	Dr. Julia Frisch
German 1	DFMME-101	P610-0435	1	4VU	2	Dr. Julia Frisch
German 2	DFMME-201	P610-0439	2	4VU	4	Dr. Julia Frisch
Hydraulic Servo-Motors	DFMME-2b1	P610-0450	2	2V+2U	5	Prof. Dr.-Ing. Jochen Gessat
Industrial Manufacturing 1	DFMME-1a1	P610-0445	1	2V+2S	5	Prof. Dr. Jürgen Griebsch
Industrial Manufacturing 2	DFMME-2a1	P610-0448	2	4V+4S	10	Prof. Dr. Jürgen Griebsch
Intercultural Management 1	DFMME-104	P610-0438	1	2VU	2	Dr. Julia Frisch
Intercultural Management 2	DFMME-204	P610-0442	2	2VU	2	Dr. Julia Frisch

Module name (EN)	Code	SAP-P	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Interdisciplinary Product Development	DFMME-1b1	P610-0447	1	3SU+3PA	10	Prof. Dr. Bernd Heidemann
Legislation and Regulation	DFMME-111	P610-0444	1	3V+1U	5	Studienleitung
Motion Control Technology	DFMME-2b2	P610-0451	2	3V+2P	5	Prof. Dr. Andrea Bohn
Product Development Using New Material Concepts	DFMME-2b3	P610-0452	2	4V+2PA	8	Prof. Dr. Bernd Heidemann
Production Systems 1	DFMME-1a2	P610-0446	1	1V+2SU+1P	5	Prof. Dr. Jürgen Griebsch
Production Systems 2	DFMME-2a2	P610-0449	2	5PA	8	Prof. Dr. Jürgen Griebsch
The Statistics and Theory of Numerical Simulation	DFMME-110	P610-0443	1	5V+3U	8	Prof. Dr. Marco Günther

(18 modules)

Mechanical Engineering Master - optional courses (overview)

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

(0 modules)

Mechanical Engineering Master - mandatory courses

English 1

Module name (EN): English 1

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-103

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

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
English

Assessment:
Written exam (50%) and tests (50%)
Written exam 90 min.

[*updated 08.08.2024*]

Applicability / Curricular relevance:

DFMEES-103 (P610-0128) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-103 (P610-0275) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-103 (P610-0437) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

Learning outcomes:
After successfully completing this module, students will:
understand adapted topic-related English-language specialist texts and product descriptions from the field of engineering science
have developed and expanded their subject-specific vocabulary and consolidated it through oral and written use
have developed strategies and methods for compiling and summarizing important information in a presentation, an experimental setup or a technical lecture in English

[*updated 08.08.2024*]

Module content:
In coordination with the DFHI Master´s degree programs in Electrical Engineering, Computer Science and European Construction Management, the content is based on common general and technical language requirements. The initial level is B1.
Technical language used in technical standards and instructions
Discussion of topic-related specialist texts from the entire spectrum of the subject
Corporate structure (centralized and decentralized organizations)
Reading, describing, evaluating and creating graphics and tables
Instructions and reports (test protocols, laboratory reports, test reports)
Presentations in a business context (e.g. on software, services, company portfolio)

[*updated 08.08.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work. A subject-related presentation on the course content is obligatory.
Short written or oral reviews of learning progress are possible at any time.

[*updated 08.08.2024*]

Recommended or required reading:
Literature and learning materials will be provided during the course

[*updated 08.08.2024*]

English 2

Module name (EN): English 2

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-203

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

ECTS credits:
2

Semester: 2

Mandatory course: yes

Language of instruction:
English

Assessment:
Written exam (50%) and tests (50%)

[*updated 29.04.2024*]

Applicability / Curricular relevance:

DFMEES-203 (P610-0139) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-203 (P610-0283) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course
DFMME-203 (P610-0441) Mechanical Engineering, Master, ASPO 01.10.2024 , 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:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

Learning outcomes:
After successfully completing this module, students will be able to:
understand topic-related English-language specialist texts and product descriptions from the field of engineering science and be able to adequately reproduce their content
expand their subject-specific vocabulary as well as their knowledge of situationally appropriate language registers and consolidate both through oral and written practice
explain technical constructions and mechanisms of action using the appropriate language
write their own technical texts such as short reports, descriptions of laboratory experiments and project/product descriptions

[*updated 29.04.2024*]

Module content:
In coordination with the DFHI Master´s degree programs in Electrical Engineering, Computer Science and

European Construction Management, the content is based on common general and technical language requirements and expands on the content covered in English 1. The initial level is therefore B1+/B2.

Technical language used in technical standards and instructions
Describing technical systems (on the basis of authentic technical texts, videos, etc.)
Describing cause and effect based on technical systems (language of cause and effect, passive voice)
Composing instructions and reports (test protocols, laboratory reports, test reports)
The changing working world (digitalization)
Presentation techniques and the structure of presentations

[*updated 29.04.2024*]

Teaching methods/Media:

The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.

Short written or oral reviews of learning progress are possible at any time.

[*updated 29.04.2024*]

Recommended or required reading:

Multimedia-supported teaching and learning material to intensify teaching will be provided in the course and via Moodle.

[*updated 29.04.2024*]

French I

Module name (EN): French I

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-102

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
French

Assessment:
Written exam (50%) + presentation (25%) + tests (25%)

[*updated 08.01.2024*]

Applicability / Curricular relevance:

DFMEES-102 (P610-0127) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-102 (P610-0276) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-102 (P610-0436) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 15 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

Learning outcomes:
The module is based on level C1 of the CEFR.
After successfully completing this module, students will:
be able to understand the content of longer, demanding texts on current topics as well as engineering presentations within and outside their subject area and grasp implicit meanings.
have acquired the productive and receptive language skills required for communication in their studies and everyday life.
be able to express themselves in a clear, structured and logically comprehensible manner on current topics from science and society, write a comprehensive written paper on topics from their field of interest or specialization and give a comprehensible lecture/presentation.
be able to apply the central rules of grammar at C1 level.
will be able to implement strategies for autonomous learning in order to make their own learning process more effective and improve their own learning ability.

[*updated 08.01.2024*]

Module content:
Based on reading, audio and video examples on current topics of general social and subject-specific interest and with the help of selected exercises on vocabulary and grammar, students will learn strategies that will enable them to communicate confidently and fluently in the resp. foreign language.

Students:
will become familiar with different types of texts and writing styles,
will practice analyzing, summarizing and critically commenting on complex issues.
will acquire the ability to explain points of view in writing and orally, to grasp nuances of meaning and to deepen the accuracy of expression
Reading, describing, evaluating and creating graphics and tables

Instructions and reports (test protocols, laboratory reports, test reports)
Presentations in a business context (e.g. on software, services, company portfolio)

[*updated 08.01.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Students will review and deepen selected aspects of grammar in self-study with given (online) materials (on Moodle).
Multimedia-supported teaching and learning material, also online

[*updated 08.01.2024*]

Recommended or required reading:
Recommended literature and working materials will be announced and made available during the course.

[*updated 08.01.2024*]

French II

Module name (EN): French II

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-202

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
2

Semester: 2

Mandatory course: yes

Language of instruction:
French

Assessment:
Written exam (50%) + presentation (25%) + tests (25%)

[*updated 08.01.2024*]

Applicability / Curricular relevance:

DFMEES-202 (P610-0138) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-202 (P610-0282) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course

DFMME-202 (P610-0440) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 15 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

Learning outcomes:
The module is based on level C1 of the CEFR.
After successfully completing this module, students will:
- be able to understand more complex texts, such as scientific articles or technical literature, in French in detail and analyze them adequately,
- be able to use the relevant specialist terminology from the subject area in French in a form relevant to communication,
and competently develop communication strategies for demanding professional situations in international management and apply them accordingly,
- be able to give academic presentations in French and conduct academic discussions in the foreign language while competently representing their points of view,
- be able to negotiate and hold technical discussions in French without any problems and communicate in the same way in general,
and write complex written reports in French in an appropriate form.

[*updated 08.01.2024*]

Module content:
Listening comprehension, reading comprehension, speaking, writing (work-related writing)
In addition, for example.: Professional problem solving strategies (national and international)
Presentations (work-related topics)
Grammar
Vocabulary (focus on technical terms)
Problem solving strategies for professional situations
Technical language used in technical standards and instructions
Describing technical systems (on the basis of authentic technical texts, videos, etc.)

[*updated 08.01.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Students will review and deepen selected aspects of grammar in self-study with given (online)

materials (on Moodle).
Multimedia-supported teaching and learning material, also online

[*updated 08.01.2024*]

Recommended or required reading:
Recommended literature and working materials will be announced and made available during the course.

[*updated 08.01.2024*]

German 1

Module name (EN): German 1

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-101

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (50%) and tests (50%)
Written exam 90 min.

[*updated 08.08.2024*]

Applicability / Curricular relevance:

DFMEES-101 (P610-0126) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-101 (P610-0274) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-101 (P610-0435) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 15 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

Learning outcomes:
The module is based on level C1 of the CEFR.
After successfully completing this module, students will:
be able to understand the content of longer, demanding texts on current topics as well as engineering presentations within and outside their subject area and grasp implicit meanings.
have acquired the productive and receptive language skills required for communication in their studies and everyday life.
be able to express themselves in a clear, structured and logically comprehensible manner on current topics from science and society, write a comprehensive written paper on topics from their field of interest or specialization and give a comprehensible lecture/presentation.
be able to apply the central rules of grammar at C1 level.
will be able to implement strategies for autonomous learning in order to make their own learning process more effective and improve their own learning ability.

[*updated 08.08.2024*]

Module content:
In this module, students will develop their knowledge of German as a foreign language at an advanced written language level, taking into account subject-related and intercultural aspects.

Based on reading, audio and video examples on current topics of general social and subject-specific interest and with the help of selected exercises on vocabulary and grammar, students will learn strategies that will enable them to communicate confidently and fluently in the resp. foreign language.

After successfully completing this module, students will:
have become familiar with different types of texts and writing styles,
have practiced analyzing, summarizing and critically commenting on complex issues.
have acquired the ability to explain points of view in writing and orally, to grasp nuances of meaning and to deepen the accuracy of expression
have learned selected grammatical structures such as prepositional phrases, participial constructions, noun-verb-conjunctions, passive and passive substitutes, nominalization-verbalization, connectors, modal particles and genitive attributes.

[*updated 08.08.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Students will review and deepen selected aspects of grammar in self-study with given (online) materials (on Moodle).

Multimedia-supported teaching and learning material, also online

[*updated 08.08.2024*]

Recommended or required reading:
Recommended literature and working materials will be announced and made available during the course.

[*updated 08.08.2024*]

German 2

Module name (EN): German 2

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-201

Hours per semester week / Teaching method:
4VU (4 hours per week)

ECTS credits:
4

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (50%) and tests (50%)
Written exam 90 min.

[*updated 08.08.2024*]

Applicability / Curricular relevance:

DFMEES-201 (P610-0137) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-201 (P610-0281) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course
DFMME-201 (P610-0439) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 2, mandatory course

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 120 hours (equivalent to 4 ECTS credits).
There are therefore 75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

Learning outcomes:
The module is based on level C1 of the CEFR.
After successfully completing this module, students will:
be able to understand the content of longer, demanding texts on current topics as well as engineering presentations within and outside their subject area and grasp implicit meanings.
have acquired the productive and receptive language skills required for communication in their studies and everyday life.
be able to express themselves in a clear, structured and logically comprehensible manner on current topics from science and society, write a comprehensive written paper on topics from their field of interest or specialization and give a comprehensible lecture/presentation.
be able to apply the central rules of grammar at C1 level.
will be able to implement strategies for autonomous learning in order to make their own learning process more effective and improve their own learning ability.

[*updated 08.08.2024*]

Module content:
In this module, students will develop their knowledge of German as a foreign language at an advanced written language level, taking into account subject-related and intercultural aspects.

Based on reading, audio and video examples of current topics of general and subject-specific interest, as well as with the help of selected exercises on vocabulary and grammar, students will review and deepen the strategies that enable them to communicate confidently and fluently in the foreign language.

After successfully completing this module, students will:
be able to review and deepen their knowledge of different types of texts and writing styles,
have expanded their ability to analyze, summarize and critically comment on complex issues, to grasp nuances of meaning and to deepen the accuracy of expression.
have improved their knowledge of selected grammatical structures.

[*updated 08.08.2024*]

Teaching methods/Media:
The learning content is developed in a communicative and action-oriented manner with targeted listening, reading and speaking exercises in individual, partner and group work.
Students will review and deepen selected aspects of grammar in self-study with given (online) materials (on Moodle).
Multimedia-supported teaching and learning material, also online

[*updated 08.08.2024*]

Recommended or required reading:
Recommended literature and working materials will be announced and made available during the course.

[*updated 08.08.2024*]

Hydraulic Servo-Motors

Module name (EN): Hydraulic Servo-Motors

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-2b1

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 01.10.2024 , 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
MAM_24_PE_2.04.SHY Engineering and Management, Master, SO 01.10.2024 , 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):
None.

Recommended as prerequisite for:

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

Lecturer: Prof. Dr.-Ing. Jochen Gessat

[*updated 08.07.2019*]

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 Manufacturing 1

Module name (EN): Industrial Manufacturing 1

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-1a1

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 01.10.2024 , 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
MAM_24_IP_1.08.IP1 Engineering and Management, Master, SO 01.10.2024 , 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:

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer: Prof. Dr. Jürgen Griebsch

[*updated 08.07.2019*]

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: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-2a1

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 01.10.2024 , 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
MAM_24_IP_2.10.IP2 Engineering and Management, Master, SO 01.10.2024 , 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):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer: Prof. Dr. Jürgen Griebsch

[*updated 08.07.2019*]

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
  - Business processes
  - 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*]

Intercultural Management 1

Module name (EN): Intercultural Management 1

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-104

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

ECTS credits:
2

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam and oral presentation (each 50%)

[*updated 15.04.2024*]

Applicability / Curricular relevance:

DFMEES-104 (P610-0129) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 1, mandatory course
DFI-104 (P610-0277) Computer Science, Master, ASPO 01.10.2018 , semester 1, mandatory course
DFMME-104 (P610-0438) Mechanical Engineering, Master, ASPO 01.10.2024 , semester 1, mandatory course

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

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

Learning outcomes:
After successfully completing this module, students will be able to:
recognize communicative and (work) cultural causes for problems in intercultural situations
reflect on their own cultural imprint, especially with regard to communication behavior and (work) behavior in teams
develop solution strategies for challenges in multicultural work contexts
understand the work-cultural and communicative characteristics of the Arab world and can compare these to their own expectations of communication and work situations

[*updated 15.04.2024*]

Module content:
Consolidation of basic concepts and models from the subject areas of culture, communication and perception of others (alignment of students´ previous knowledge)
Conflict behavior and solution strategies in an intercultural work context (teamwork, hierarchies, understanding work and roles, metacommunication)
Cultural (self-)awareness as a key competence
Case studies and practical exercises
Non-European focus: the Arab world

[*updated 15.04.2024*]

Teaching methods/Media:
Lecturer presentations
(Interactive) exercises and case studies

Group work
Digital content via moodle

[*updated 15.04.2024*]

Recommended or required reading:
Will be announced in the course
Multimedia-supported teaching and learning material to intensify teaching will be provided in the course and via Moodle.

[*updated 15.04.2024*]

Intercultural Management 2

Module name (EN): Intercultural Management 2

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-204

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

ECTS credits:
2

Semester: 2

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam and oral presentation (each 50%)

[*updated 15.04.2024*]

Applicability / Curricular relevance:

DFMEES-204 (P610-0096) Electrical Engineering - Renewable Energy and System Technology, Master, ASPO 01.10.2019 , semester 2, mandatory course
DFI-204 (P610-0284) Computer Science, Master, ASPO 01.10.2018 , semester 2, mandatory course
DFMME-204 (P610-0442) Mechanical Engineering, Master, ASPO 01.10.2024 , 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:

Module coordinator:
Dr. Julia Frisch

Lecturer: Dr. Julia Frisch

[*updated 17.08.2020*]

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

weigh up different models of intercultural competence(s) against each other
explain strategies for acquiring intercultural competence(s)
work on smaller intercultural training units as part of a simulation/management game
discuss the Euro/US-centric perspective of various common studies and models in the field of intercultural business communication

[*updated 15.04.2024*]

Module content:
Constructive intercultural management
Intercultural learning and intercultural forms of training
Change of perspective: working with multicultural colleagues and team members in the company or within their own projects
Opportunities, limits and risks of comparative cultural models in everyday working life
Case studies and practical exercises
Possible focuses: Europe outside of Germany and France, USA

[*updated 15.04.2024*]

Teaching methods/Media:
Lecturer presentations
(Interactive) exercises and case studies
Group work
Digital content via moodle

[*updated 15.04.2024*]

Recommended or required reading:
Will be announced in the course
Multimedia-supported teaching and learning material to intensify teaching will be provided in the course and via Moodle.

[*updated 15.04.2024*]

Interdisciplinary Product Development

Module name (EN): Interdisciplinary Product Development

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-1b1

Hours per semester week / Teaching method:
3SU+3PA (6 hours per week)

ECTS credits:
10

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Exam (Duration: 90 minutes) (50%) + Project (50%)

[*updated 13.11.2024*]

Applicability / Curricular relevance:

DFMME-1b1 (P610-0447) Mechanical Engineering, Master, ASPO 01.10.2024 , 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
MAM_24_PE_1.04.IPE Engineering and Management, Master, SO 01.10.2024 , 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:

Module coordinator:
Prof. Dr. Bernd Heidemann

Lecturer: Prof. Dr. Bernd Heidemann

[*updated 08.07.2019*]

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, define 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 13.11.2024*]

Module content:
Introduction - Terms and definitions
The technical product - needs and requirements Generating and satisfying demand Utility and prestige benefits Satisfaction of the prestige utility

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. Systematic variation of solution properties

Special methods for clarifying tasks: e.g. quality function deployment (QFD) and sensible modifications, use of social media and online tools, stakeholder management.

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.

Human-machine interface and communication in socio-technical systems of action.

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.

The term over-engineering
The methods of value analysis and target costing
The method complex for FMEA and its variants

[*updated 13.11.2024*]

Teaching methods/Media:
Seminar-based, interactive classes, including contributions prepared by pairs of students.

The Project course achievement is completed on the basis of an individual project plan with defined, measurable objectives, which is based on the content of the course and, in consultation with the lecturer, also contains 5 self-defined focal points from the field of product development, which correspond to individual interests.

The project topic with its individual focus can be defined by the student.
The project will be monitored in weekly work meetings.

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

[*updated 13.11.2024*]

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 13.11.2024*]

Legislation and Regulation

Module name (EN): Legislation and Regulation

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-111

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 01.10.2024 , semester 1, mandatory course
MAM_19_A_1.03.RER (P241-0085) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course
MAM_24_A_1.03.RER Engineering and Management, Master, SO 01.10.2024 , 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: Studienleitung

[*updated 08.07.2019*]

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*]

Motion Control Technology

Module name (EN): Motion Control Technology

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-2b2

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 01.10.2024 , 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
MAM_24_PE_2.05.BWT Engineering and Management, Master, SO 01.10.2024 , 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 08.07.2019*]

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*]

Product Development Using New Material Concepts

Module name (EN): Product Development Using New Material Concepts

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-2b3

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 01.10.2024 , 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
MAM_24_PE_2.06.PEW Engineering and Management, Master, SO 01.10.2024 , 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:

Module coordinator:
Prof. Dr. Bernd Heidemann

Lecturer: Prof. Dr. Bernd Heidemann

[*updated 08.07.2019*]

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: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-1a2

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 01.10.2024 , 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
MAM_24_IP_1.09.PS1 Engineering and Management, Master, SO 01.10.2024 , 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:

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer: Prof. Dr. Jürgen Griebsch

[*updated 08.07.2019*]

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: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-2a2

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 01.10.2024 , 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
MAM_24_IP_2.11.PS2 Engineering and Management, Master, SO 01.10.2024 , semester 1, 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:

Module coordinator:
Prof. Dr. Jürgen Griebsch

Lecturer: Prof. Dr. Jürgen Griebsch

[*updated 08.07.2019*]

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*]

The Statistics and Theory of Numerical Simulation

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

Degree programme: Mechanical Engineering, Master, ASPO 01.10.2024

Module code: DFMME-110

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 01.10.2024 , semester 1, mandatory course
MAM_19_A_1.01.MTS (P241-0088) Engineering and Management, Master, ASPO 01.10.2019 , semester 1, mandatory course
MAM_24_A_1.01.MTS Engineering and Management, Master, SO 01.10.2024 , 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:

Module coordinator:
Prof. Dr. Marco Günther

Lecturer: Prof. Dr. Marco Günther

[*updated 08.07.2019*]

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*]

Mechanical Engineering Master - optional courses