Hochschule Aalen
Technik, Wirtschaft und Gesundheit

Modulhandbuch
Mechanical Engineering (EME)
SPO 34

Stand: September 2025

87001 SPO-Version: 34
Mathematics 1

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Holger Schmidt
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	90 Hours
Workload Self-Study	60 Hours
Participation Requirements	none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence
Students can apply the fundamentals of analysis, linear algebra and methods of scientific computing: They can formulate basic engineering problems mathematically and work on them systematically using suitable methods. They are also able to interpret results in the context of the task.

Interdisciplinary Competence
Students are able to solve exercises in groups and discuss different solutions. They can present their results to others.

Course Content

Fundamentals of analysis (elementary function, differential and integral calculus, Taylor series, sequences/series)
Fundamentals of linear algebra (systems of equations, vector spaces, matrices, eigenvalues/eigenvectors)
Complex numbers and complex functions
Introduction to scientific computing with Python (NumPy/SciPy, MatPlotLib, Sympy)

Literature

Lecture notes and Jupyter notebooks for the lecture
S. Boyd, *Introduction to Applied Linear Algebra*, Cambridge University Press
K. A. Stroud, *Engineering Mathematics*, Red Globe Press
K. A. Stroud, *Advanced Engineering Mathematics*, Red Globe Press

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
87101	Mathematics 1	Prof. Dr. Holger Schmidt	V,Ü	6	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
87101	PLK (120 Minutes)	100%	

Requirements for Admission to the Module Exam
Successful participation in the exercises

Further Study-Related Feedback

Comments

Last Update: 15.06.2024, Prof. Dr. Holger Schmidt

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87002 SPO-Version: 34
Materials Science

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Rainer Börret
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence
Students can describe the mechanical, electrical and optical properties of the various materials and are able to select the appropriate material for an application (e.g. optics, housing, circuit board). Students will be able to select materials on the basis of an engineering calculation in which they can determine whether the material properties fulfil the respective requirements.

Interdisciplinary Competence
Students can communicate in technical English and use the relevant material science and engineering vocabulary.
The exercises take place in small groups, so students can train their interdisciplinary skills while working in teams. Results can be presented to the other groups and discussed.

Course Content

- Atomic models
- crystal structures
- mechanical properties of materials
- failure
- Electrical properties of materials
- optical properties of materials
- phase diagrams

Literature

Recommendation:
William D. Callister Jr., David G. Rethwisch: Materials Science and Engineering, Wiley
Slides, Exercises on Canvas

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[3]	SWS	CP
87102	Material Science	Rainer Börret	V	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[4]	Determination of Module Grades	Comments
87102	PLK (60 Minutes)	100%	

Requirements for Admission to the Module Exam
-

Further Study-Related Feedback
-

Comments
none

Last Update: 04.07.2024, Prof. Dr. Rainer Börret

[3] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[4] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88001 SPO-Version: 34

Engineering Mechanics 1

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Miranda Fateri
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	N.A
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence
Students will be able to analyze forces and moments (planar and spatial) for mechanical tasks in statics. They can determine the center of gravity of complex objects and draw free-body diagrams for complex systems. They will be able to analyze the Equilibrium equations. Moreover, they can perform analytical calculations of support reactions, including those for trusses. Additionally, they will be able to analyze internal normal and shear forces, as well as bending moment diagrams of beams. Furthermore, they can analyze and apply the principles of friction and hydrostatics.

Interdisciplinary Competence
Students are able to work on given tasks in small teams both within and outside of tutorials. Additionally, students can complete graded and ungraded quizzes throughout the entire semester, individually and in teams.

Course Content

Basic definitions
Description of vectors, force, moment in Cartesian coordinate systems
Components of a force and the resultant force for a system
Center of gravity
Equilibrium
Degrees of freedom and support reactions
Beam internal forces and moments
Truss
Friction
Introduction to Hydrostatic

Literature

English:
Engineering Mechanics: Statics, J. L. Meriam, L. G. Kraige, John Wiley & Sons Inc; 7th edition (2011)

Engineering Statics: Open and Interactive, D. W. Baker, W. Haynes, 2020.

German:
Technische Mechanik Teil 1 Elastostatik - Gross, Hauger, Schröder, Wall, Springer Verlag Berlin Heidelberg New York Technische Mechanik 1 Statik –

Russell C. Hibbeler, Pearson Studium 2018 Technische Mechanik. Statik; Lehrbuch mit Praxisbeispielen - Richard, Hans Albert, Sander, Manuela 2008

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[5]	SWS	CP
88101	Engineering Mechanics 1	Prof. Dr. Miranda Fateri	V	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[6]	Determination of Module Grades	Comments
88101	PLK (90 Minutes)	100%	

Requirements for Admission to the Module Exam
N.A

Further Study-Related Feedback
N.A

Comments
-

Last Update: 17.06.2024, Prof. Dr. Miranda Fateri

[5] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[6] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87003 SPO-Version: 34
German as a Foreign Language 1

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Miguel Vázquez, Head of Language Center
Modul Type	Mandatory Module for international students
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal: none Content: none
Use in other SG	Mechatronics Engineering
Language	English and German

Module Objectives

General
This course, based on CEFR level A.1.1, is intended for students with no previous knowledge of the German language. Task-based teaching and other classroom activities, including individual group work and compulsory homework, will provide a variety of the basic techniques to use the main vocabulary and grammar of the language. At the end of the course, they will be able to talk about themselves and their areas of study and ask others about personal details, work, hobbies, and interests. The students will be able to use simple sentences and expressions in daily life situations and will be able to interact in a simple way provided the other person talks slowly and is prepared to help (see also CEFR https://www.coe.int/en/web/common-european-framework-reference-languages/the-cefr-descriptors). Course material will be provided by the library, the lecturer and the Language Center.

Professional Competence
Students will demonstrate a good level of communication and empathy and will master interactions with other people. They will develop an awareness of social and cultural conditions enabling them to act appropriately in complex situations Students are able to apply strategies and methods for the formation and maintenance of networks in this area.

Interdisciplinary Competence
This course involves the integration of basic cultural, linguistic, geographical, and social studies to enhance learning. Students are introduced to German-speaking countries' customs, holidays, and traditional foods. They compare simple vocabulary and sentence structures between German and English or their native language. Geography lessons include identifying major German-speaking countries and cities on a map. Literature and music exposure involves reading stories and listening to German songs. Technology integration uses language learning apps and watching short German clips with subtitles (e.g. within Speexx). Role-playing helps practice everyday communication like greetings and ordering food. Social studies cover typical daily routines and school systems in Germany. Basic business etiquette includes learning formal greetings and simple business customs. This approach provides a well-rounded, contextual introduction to the German language and culture.

Course Content See description above.

Literature DaF Kompakt neu, Klett Verlag, Script

Included Courses (LV)

LV-Nr.	Course Name	Lecturer	Type[7]	SWS	CP
87103	German as a Foreign Language 1	Behzad Moini	Ü, S	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[8]	Determination of Module Grades	Comments
87103	PLK (90 Minutes)	100% - not graded	

Requirements for Admission to the Module Exam
Participation in Practical Training, 70% of attendance

Further Study-Related Feedback

-

Comments
Mandatory module for international students at A1.1-level

Last Update: 06.03.2025, Miguel Vázquez, Head of Language Center

[7] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[8] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87003 SPO-Version: 34
Technical English 1

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Miguel Vázquez, Head of Language Center
Modul Type	Mandatory Module for German students
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	30 Hours
Workload Self-Study	120 Hours
Participation Requirements	Formal: none Content: none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

General

This course is designed to support the receptive and productive skills of technical language competencies across four skills: speaking, listening, reading and writing at the reference level B2.1 of the Common European Framework of Reference for Languages. Students will be better able to understand the main content of technical texts and discussions from different subject areas and to communicate spontaneously in interdisciplinary contexts. A range of topics will provide the framework for the application of oral and written communicative competency.
Autonomous work outside the class as well as active in-class participation, interaction and feedback will be expected in class. To successfully complete the course, students will need to complete collaborative in-class assignments, submit coursework and give a presentation. The course consists of two modules.
In Module 1 we will focus on the revision of grammar structures in a technical context. New vocabulary and expressions will be explained and applied. The vocabulary is presented in authentic texts and credible scenarios, ensuring maximal practicality for the students. Teaching materials related to the students' major fields of study form the framework for the development and application of further, often subject-specific language skills, (that) are required for effective language competence in the technical field. In addition, more complex technical forms of written and oral communication are analyzed and actively produced.

Professional Competence

Professional competence (social skills und ability to work independently): Students must demonstrate a high level of communication and empathy in their professional life. Therefore, successful interactions with other people are practiced in a task-based training. The development of an awareness of social and cultural conditions with the goal to act appropriately in complex situations constitute another important block in this lecture. Students will learn strategies and methods for the formation and maintenance of networks in this area.

Interdisciplinary Competence

In this technical English lecture, "Interdisciplinary Competence" integrates various fields and communication skills. Students learn essential technical vocabulary and grammar, focusing on terms used in engineering, IT, and science. They develop writing skills by creating simple technical descriptions and reports. Reading comprehension is enhanced through simplified technical articles and manuals. Listening skills are improved with short technical lectures and videos, emphasizing note-taking. Presentation skills are built through short technical presentations using visual aids. Practical communication is practiced via role-playing technical scenarios. Collaborative projects apply technical English in group settings. Real-world case studies are discussed to identify key issues and solutions. Cultural competence is developed by understanding international technical communication styles.

Course Content See description above.

Literature Script, Books: Vocabulary and Grammar (Nick Brieger, Alison Pohl - Summertown Publishing Ltd.)

Included Courses (LV)

LV-Nr.	Course Name	Lecturer	Type[9]	SWS	CP
87104	Technical English 1	Doris Düwel	Ü, S	2	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[10]	Determination of Module Grades	Comments
87104	PLK (90 Minutes)	100% - not graded	

Requirements for Admission to the Module Exam
Participation in Practical Training, 70% of attendance

Further Study-Related Feedback

-

Comments
Mandatory Module for German students at B2.1-level

Last Update: 06.03.2025, Miguel Vázquez, Head of Language Center

[9] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[10] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87004 SPO-Version: 34

Computer Science 1

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Stefan Hörmann
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence

Students will be able to

- apply basic structures and details of the Python programming language, in particular control structures, variables, simple data structures, dealing with objects and structuring with the help of methods.
- independently develop small, executable Python programs according to precise, textual specifications.
- analyze and evaluate Python programs.

Interdisciplinary Competence

By carrying out the programming exercises in teams of two, students are able to solve tasks together and work as a team.

Course Content

Structure, syntax and formatting of Python programs
Types, values, variables, constants
Lists, sets
Objects and classes
Operators
Control structures
Methods
Visibility and validity of variables
Recursion, call hierarchy
References
Input/output
Interactive console applications
Programming elementary algorithms (sorting procedures or math formulas)
Analysis of programs in the debugger

Literature

M. Lutz, *Learning Python*, O'Reilly Media
D. Beazley and B. Jones, *Python Cookbook*, O'Reilly Media
E. Matthes, *Python Crash Course*, No Starch Press

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[11]	SWS	CP
87105	Computer Science 1	Prof. Dr. Stefan Hörmann	V,Ü	4	5

Mo5dule Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[12]	Determination of Module Grades	Comments
87105	PLK (90 Minutes)	100%	

Requirements for Admission to the Module Exam
Successful participation in the programming exercises

Further Study-Related Feedback

Comments

Last Update: 15.06.2024, Prof. Dr. Stefan Hörmann

[11] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[12] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88002 SPO-Version: 34
3D-CAX

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Markus Merkel
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	2
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	Mechatronics Engineering
Language	English

Module Objective

Professional Competence:
The students are able to define 3D geometry guided by the idea of the digital product development process. They will be able to use a 3D-CAD system for engineering applications. They are proficient in designing individual components and assemblies. The students can extract technical drawings out of 3D-CAD systems.
They are capable of describing the individual steps in the development process systematically and methodically (e.g., CAD-CAE, CAD-CAM, CAD-MKS, CAD-VR, CAD-RE process chain). Additionally, students will be able to discuss and evaluate complex organizational relationships within the context of virtual product development.

Interdisciplinary Competence ("social competence" and "independence"):
The students develop social competencies independently, as a part of a team and are able to apply their acquired technical knowledge in an interdisciplinary context.

Course Content

- Fundamentals of computer-aided product development
- Surface modeling, volume description;
- Lifecycle engineering, virtual engineering, collaborative engineering
- Virtual reality, Digital twin
- Digital Mock Up
- Simulation in the CAD environment
- Model-based definition with ISO-GPS
- Generative Design, Knowledge-based engineering
- CAD/CAM software and hardware
- PDM/PLM systems
- Coupling CAD/CAE
- Reverse engineering

3D-CAD designing: Building 3D geometry by 3D-CAD solid modeler, transferring individual components into assemblies, Extracting Drawings, production documents, Surface modeling

Literature

- Coticchia, M. E., Crawford, G. W., Preston, E. J. (1993). CAD/CAM/CAE Systems: Justification, Implementation, Productivity Measurement, Second Edition, Hongkong: Taylor & Francis.
- Advances in CAD/CAM/CAE Technologies. (2020). Schweiz: MDPI AG.
- Sendler, U. (2013). CAD & Office Integration: OLE for Design and Modeling. A New Technology for CA Software. Deutschland: Springer Berlin Heidelberg.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[13]	SWS	CP
88102	CAD/CAE/CAM	Prof. Dr. Markus Merkel	V	2	5
88103	3D-CAD	Prof. Dr. Markus Merkel	L, Ü	2	

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[14]	Determination of Module Grades	Comments
88102	PLK 60 Minutes	50%	
88103	PLL 60 Minutes	50%	During the semester

Requirements for Admission to the Module Exam
PLL passed.

Further Study-Related Feedback

Comments
none

Last Update: 06.03.2025, Prof. Dr. Markus Merkel

[13] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[14] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87005 SPO-Version: 34
Mathematics 2

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Holger Schmidt
Modul Type	Mandatory Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	90 Hours
Workload Self-Study	60 Hours
Participation Requirements	none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence
Students can apply in-depth knowledge of analysis, linear algebra and methods of scientific computing. They can formulate in-depth engineering problems mathematically and work on them systematically using suitable methods. They are also able to interpret results in the context of the problem.

Interdisciplinary Competence
Students are able to solve exercises in groups and discuss different solutions. They can present their results to others.

Course Content

Multidimensional analysis
Vector analysis
Ordinary differential equations and systems of differential equations: Analytical and numerical solution methods
Fourier series
Fourier and Laplace transforms
Specialization in Scientific Computing

Literature

Lecture notes and Jupyter notebooks for the lecture
S. Boyd, *Introduction to Applied Linear Algebra*, Cambridge University Press
K. A. Stroud, *Engineering Mathematics*, Red Globe Press
K. A. Stroud, *Advanced Engineering Mathematics*, Red Globe Press

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[15]	SWS	CP
87201	Mathematics 2	Prof. Dr. Holger Schmidt	V,Ü	6	5

[15] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[16]	Determination of Module Grades	Comments
87201	PLK (120 Minutes)	100%	

Requirements for Admission to the Module Exam
Successful participation in the exercises

Further Study-Related Feedback

Comments

Last Update: 15.06.2024, Prof. Dr. Holger Schmidt

[16] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88003 SPO-Version: 34
Electrical Engineering

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Jens Krotsch
Modul Type	Mandatory Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal: None Content: Solid basic mathematical knowledge, differential and integral calculus, complex numbers, and good basic understanding of physics.
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence
The students can describe the fundamental concepts of electrical engineering and relevant electrical quantities, are able to name and explain important components of electrical circuits and can express their properties mathematically. They can describe the basic circuit calculation methods, the basics of circuit simulation and can apply these to direct current, alternating current and three-phase circuits. The students are able to analyze and adapt simple electrical networks with stationary and non-stationary quantities.
The students can classify the dangers of electrical voltage and current and are aware of the responsibility involved in dealing with electricity.

Interdisciplinary Competence
The students are able to proceed methodically and to critically question results.

Course Content

- Basic concepts and electrical quantities
- Direct current (DC) circuits: conductors, current density, ideal and linear sources, basics of circuit analysis, nonlinear resistors, measurement of electr. quant., circuit simulation
- Alternating current (AC) circuits: components, RMS, vector representation, calculation using complex numbers, apparent, active and reactive power
- Multiphase AC systems and transformers

Literature

- J. Krotsch; *Comprehensive lecture notes*, Aalen University of Applied Sciences
- F. Hüning; *Fundamentals of Electrical Engineering for Mechatronics*, De Gruyter
- V. Hacker and C. Sumereder; *Electrical engineering: fundamentals*, De Gruyter
- Y. Singh and M. Verma; *Fundamentals of Electrical Engineering*, Laxmi
- S. A. Reza Zekavat; *Electrical Engineering: Concepts and Applications*, Pearson

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[17]	SWS	CP
88201	Electrical Engineering	Prof. Dr. Jens Krotsch	V,L,Ü	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[18]	Determination of Module Grades	Comments
88201	PLK (90 Minutes)	100%	Permitted aids: Pocket calc. and formula sheet

Requirements for Admission to the Module Exam
Successful completion of tests accompanying the lectures, e.g. evaluated Canvas quizzes and exercises.

Further Study-Related Feedback
None

Comments
None

Last Update: 05.08.2024, Prof. Dr. Jens Krotsch

[17] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[18] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88004 SPO-Version: 34

Engineering Mechanics 2

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Miranda Fateri
Modul Type	Mandatory Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal: Completed Engineering Mechanics 1
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence

The students can calculate the mechanical stress of statically determined elastic components and simple assemblies taking into account the tensile, compressive, shear, torsion and bending loads. Students will be able to analyze the problems regarding the state of stress (uni and biaxial loading conditions) and generalized law of elasticity.

Interdisciplinary Competence

Students are able to work in a team while solving exercises. They can also use the theoretical procedures for understanding the practical applications. They will be able to connect and address the questions of other courses such as construction of elements. The students are able to present their own solutions concisely. They can conduct assignments and quizzes on their own and also in a team. They can also discuss the industrial application of theoretical studies in teams.

Course Content

Normal Strain under Axial Loading
Stress-Strain Diagram
True Stress and True Strain
Hooke’s Law; Modulus of Elasticity
Elastic versus Plastic Behavior of a Material
Poisson’s Ratio
Uniaxial stress conditions: Tensile, Compression, Shear, Torsion and Bending
Generalized Hooke’s Law Transformations of Stress and Strain
Principal Stresses: Construction of Mohr’s Circle (biaxial stress)
General State of Stresses in Thin-Walled Pressure Vessels
Equivalent Stresses, Combined Loading Conditions

Literature

English:
Ferdinand P. Beer, E. Russell Johnston, John T. Dewolf, David F. Mazurek Gross, Hauger, Schröder, Wall, Wriggers; (2014) Mechanics of Materials - McGraw-Hill Education

D. K. Singh, (2014) Strength of Materials – CRC Press, ISBN-10: 9781482245714

German:
Altenbach, Holm (2016): Holzmann/Meyer/Schumpich Technische Mechanik Festigkeitslehre. Wiesbaden: Springer Fachmedien Wiesbaden

Arndt, Klaus-Dieter; Brüggemann, Holger; Ihme, Joachim (2021). Festigkeitslehere für Wirtschaftsingenieure: Springer, eBook ISBN
978-3-658-33548-9

Technische Mechanik. Statik - Reibung - Dynamik - Festigkeitslehre - Fluidmechanik. 32. Aufl. 2017. Wiesbaden, s.l.: Springer Fachmedien Wiesbaden. Online verfügbar unter http://dx.doi.org/10.1007/978-3-658-16203-0.

Hauger, Werner; Krempaszky, Christian; Wall, Wolfgang A. (2017): Aufgaben zu Technische Mechanik 1–3. Statik, Elastostatik, Kinetik. 9. Aufl. 2017. Online verfügbar unter http://dx.doi.org/10.1007/978-3-662-53344-4.

Johannes Wandinger (2018): Technische Mechanik 1-3. Online verfügbar unter http://wandinger.userweb.mwn.de/index.html?101, zuletzt aktualisiert am 30.01.2018.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[19]	SWS	CP
88202	Engineering Mechanics 2	Prof. Dr. Miranda Fateri	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[20]	Determination of Module Grades	Comments
88202	PLK (90 Minutes)	100%	

Requirements for Admission to the Module Exam
N.A

Further Study-Related Feedback
N.A

Comments
none

Last Update: 18.06.2024, Prof. Dr. Miranda Fateri

[19] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[20] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87006 SPO-Version: 34

German as a Foreign Language 2

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Miguel Vázquez, Head of Language Center
Modul Type	Mandatory Module for international students
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal: Passing the exam German as a Foreign Language 1 Content: none
Use in other SG	Mechatronics Engineering
Language	English and German

Module Objectives

General

This course, based on CEFR level A.1.2, is intended for students with no previous knowledge of the German language. Task-based teaching and other classroom activities, including individual group work and compulsory homework, will provide a variety of the basic techniques to use the main vocabulary and grammar of the language. At the end of the course, they will be able to talk about themselves and their areas of study and ask others about personal details, work, hobbies, and interests. The students will be able to use simple sentences and expressions in daily life situations and will be able to interact in a simple way provided the other person talks slowly and is prepared to help (see also CEFR https://www.coe.int/en/web/common-european-framework-reference-languages/the-cefr-descriptors). Course material will be provided by the library, the lecturer and the Language Center.

Professional Competence

Students will demonstrate a good level of communication and empathy and will master interactions with other people. They will develop of an awareness of social and cultural conditions enabling them to act appropriately in complex situations- Students are able to apply strategies and methods for the formation and maintenance of networks in this area.

Interdisciplinary Competence

This course involves the integration of basic cultural, linguistic, geographical, and social studies to enhance learning. Students are introduced to German-speaking countries' customs, holidays, and traditional foods. They compare simple vocabulary and sentence structures between German and English or their native language. Geography lessons include identifying major German-speaking countries and cities on a map. Literature and music exposure involves reading stories and listening to German songs. Technology integration uses language learning apps and watching short German clips with subtitles (e.g. within Speexx). Role-playing helps practice everyday communication like greetings and ordering food. Social studies cover typical daily routines and school systems in Germany. Basic business etiquette includes learning formal greetings and simple business customs. This approach provides a well-rounded, contextual introduction to the German language and culture.

Course Content See description above.

Literature DaF Kompakt neu, Klett Verlag, Script

Included Courses (LV)

LV-Nr.	Course Name	Lecturer	Type[21]	SWS	CP
87202	German as a Foreign Language 2	Behzad Moini	Ü, S	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[22]	Determination of Module Grades	Comments
87202	PLK (90 Minutes)	100% - not graded	

Requirements for Admission to the Module Exam
Participation in Practical Training, 70% of attendance

Further Study-Related Feedback

-

Comments
Mandatory module for international students at A1.2-level

Last Update: 06.03.2025, Miguel Vázquez, Head of Language Center

[21] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
[22] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87006 SPO-Version: 34

Technical English 2

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Miguel Vázquez, Head of Language Center
Modul Type	Mandatory Module for German students
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	30 Hours
Workload Self-Study	120 Hours
Participation Requirements	Formal: Passing the exam Technical English 1 Content: none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

General

This course is designed to support the receptive and productive skills of technical language competencies across four skills: speaking, listening, reading and writing at the reference level B2.2 of the Common European Framework of Reference for languages.
Students will be better able to understand the main content of technical texts and discussions from different subject areas and to communicate spontaneously in interdisciplinary contexts.
A range of topics will provide the framework for the application of oral and written communicative competency.
Autonomous work outside the class as well as active in-class participation, interaction and feedback will be expected in class. To successfully complete the course, students will need to complete collaborative in-class assignments, submit coursework and give a presentation.
The course consists of two modules.
In Module 2 students will have the opportunity to practice both written and oral communication skills.
Teaching materials related to the students' major fields of study form the framework for the development and application of further, often subject-specific language skills, (that) are required for effective language competence in the technical field.
In addition, more complex technical forms of written and oral communication are analyzed and actively produced.

Professional Competence

Professional competence (social skills und ability to work independently): Students must demonstrate a high level of communication and empathy in their professional life. Therefore, successful interactions with other people are practiced in a task-based training. The development of an awareness of social and cultural conditions with the goal to act appropriately in complex situations constitute another important block in this lecture. Students will learn strategies and methods for the formation and maintenance of networks in this area.

Interdisciplinary Competence

In this technical English lecture, "Interdisciplinary Competence" integrates various fields and communication skills. Students learn essential technical vocabulary and grammar, focusing on terms used in engineering, IT, and science. They develop writing skills by creating simple technical descriptions and reports. Reading comprehension is enhanced through simplified technical articles and manuals. Listening skills are improved with short technical lectures and videos, emphasizing note-taking. Presentation skills are built through short technical presentations using visual aids. Practical communication is practiced via role-playing technical scenarios. Collaborative projects apply technical English in group settings. Real-world case studies are discussed to identify key issues and solutions. Cultural competence is developed by understanding international technical communication styles.

Course Content See description above.

Literature Script, text editing, reading comprehension, vocabulary and grammar, research tasks, and discussions. It includes analyzing texts like "The Real Jetsons - Personal Flight" (Inch - Technical English Inch by Inch, 13, 2/2017) and reading "A History of Electric Cars" by Nigel Burton (208 pages, The Crowood Press). Students will also engage in presentation preparation and delivery.

Included Courses (LV)

LV-Nr.	Course Name	Lecturer	Type[23]	SWS	CP
87203	Technical English 2	Doris Düwel	Ü, S	2	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[24]	Determination of Module Grades	Comments
87203	PLK (60 Minutes)	50%, not graded	
87203	PLP	50%, not graded	During the semester

Requirements for Admission to the Module Exam
Participation in Practical Training, 70% of attendance

Further Study-Related Feedback

-

Comments
Mandatory Module for German students at B2.2-level

Last Update: 06.03.2025, Miguel Vázquez, Head of Language Center

[23] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
[24] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

87007 SPO-Version: 34

Computer Science 2

Degree Program	Computer Science 2 - Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Stefan Hörmann
Modul Type	Mandatory Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence
The students will be able to explain and apply the basic concepts and special features of object-oriented programming. Selected applications of object-oriented programming such as graphical user interfaces and the processing of office documents can be used for the realization of practical projects.

Interdisciplinary Competence
The students are able to solve tasks together and work as a team. In addition, by working on a project, students are able to form project teams, analyze tasks, carry out the project and present the results in a presentation.

Course Content

The module introduces the basics of object-oriented programming. The following topics are covered:

Classes and instances
Definition of methods
Special methods, such as constructor, destructor, ...
Creating attributes
Inheritance
Overriding methods
Multiple inheritance
Setter and getter methods (property attributes)
Class attributes and class methods
Overloading operators
Built-in functions for object orientation
Modularization
Selected applications of object-oriented programming:
Graphical user interfaces
Processing office documents

The topics introduced are tested and consolidated in practice by working on programming exercises and a project.

Literature M. Lutz, *Programming Python*, O'Reilly Media
L. Ramalho, *Fluent Python*, O'Reilly Media
E. Matthes, *Python Crash Course*, No Starch Press

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[25]	SWS	CP
87204	Computer Science 2	Prof. Dr. Stefan Hörmann	V,Ü	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[26]	Determination of Module Grades	Comments
87204	PLK (60 Minutes)	100%	

Requirements for Admission to the Module Exam
Successful participation in the programming exercises

Further Study-Related Feedback

Comments

Last Update: 06.03.2025, Prof. Dr. Stefan Hörmann

[25] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
[26] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88005 SPO-Version: 34

Physics

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Axel Löffler
Modul Type	Mandatory Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal: none Content: none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence

Know That

The students are able to **understand** and correctly **apply** the **scientific vocabulary** in a given physical context. In addition, they are able to **quote** the **definitions** of the scientific terms.

Students know basic physical quantities and units and can work confidently with physical formulas and equations.

Know Why

The students are able to **provide examples** concerning the **definitions** of scientific terms and the application of specific **methods**. Moreover, they are able to **explain why** the application of a specific method to a given problem is **effective**.

Know How

The students are able to **analyse** given problems, to **select** and **apply appropriate methods** to solve the given problems, thereby **adapting** the standard solution processes to problem specific needs. The students can plan, execute and evaluate experiments. Furthermore, they can estimate the effect of measurement uncertainties on the final result of the experiments.

Interdisciplinary Competence

The students are able to **self-organize their learning process**, including weekly **repetition of** and **reflection on** the course material, doing **additional exercises**, deepening their knowledge by **literature study** and **preparing questions** to the lecturer. Ideally, this takes place **in teamwork** with their co-students.

Course Content

Physical Quantities and Units of Measurement

Definitions of scientific terms: observables, measurements, SI units (metrical system)
Physical quantities: measure numbers and units, comparison of physical quantities, multiplication and addition of physical quantities, unit conversion, basic physical quantities in the context of mechanics, treatment of uncertainties in measurements, how to solve a basic physical problem
The process of scientific reasoning will be trained using basic models and test cases from the following disciplines:

Kinematics and Dynamics of Translational Movements from the perspective of physics

Definitions of scientific terms: kinematic quantities (location, velocity, acceleration), mass, force, energy, work, power, momentum
Principles of classic mechanics: Newton's axioms, equations of motion, friction, examples (freefall, superimposed movements, inclined plane, impact movement, etc.), inertial forces

Kinematics and Dynamics of Rotational Movements from the perspective of physics

Definitions of scientific terms: kinematic quantities (angle, angular velocity, angular acceleration), moment of inertia, torque, energy, work, power, angular momentum
Principles of classic mechanics: Newton's axioms, equations of motion, friction, examples (hammer throw, turntable, rolling motion, etc.), inertial forces

Kinematics and Dynamics of Mechanical Oscillations from the perspective of physics

Definitions of scientific terms: (harmonic) oscillation, restoring force/momentum, frequency and circular frequency, period duration
Basic examples (spring pendulum, thread pendulum), damped oscillations, externally driven oscillations, superimposed oscillations

Physics Laboratory

Planning, execution and evaluation of physical experiments; estimation and evaluation of measurement uncertainties; the competences are trained doing two experiments: M1 (Maxwell's wheel – rolling movement) and S1 (mechanical oscillations)

Literature

R. A. Serway, J. W. Jewett: *Physics for Scientists and Engineers with Modern Physics*, Brooks Cole Publishers, 2018
D. C. Giancoli: *Physics for Scientists & Engineers with Modern Physics*, Global Edition, Pearson, 2023
R. Shankar: *Fundamentals of Physics I: Mechanics, Relativity, and Thermodynamics*, Expanded Edition, Open Yale Courses, 2019

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[27]	SWS	CP
88203	Physics	Prof. Dr. Axel Löffler	V, Ü, L	4	5

[27] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[28]	Determination of Module Grades	Comments
88203	**PLK** – written exam (90 minutes)	100%	**40** of 90 points: passed (4.0) **80** of 90 points: excellent (1.0)

Requirements for Admission to the Module Exam
The students have to be **present at 75%** of the given courses up to the last date of signing off for the exam.
In addition, they have to **complete** the following **6 MatlabAcademy** self-paced **online courses**:
Matlab Onramp, Simulink Onramp, Statistics Onramp, Optimization Onramp, Introduction to Symbolic Math (with Matlab), Introduction to Linear Algebra (with Matlab).
Finally, the students have to **carry out two laboratory experiments** at the central physics laboratory (experiments M1 and S1). The **laboratory reports** for each off the two experiments have to be graded as "**passed**".

Further Study-Related Feedback
Feedback on questions and answers both from the students and the lecturer.

Comments
The exam takes place as an **online-written exam** using **DigiExam** and **MatlabGrader**. The exam is **graded automatically**. The students may **run** their scripts **as often as they like** and **submit** them **5 times**.
Points are only awarded for correct assignments of variables. In particular, no points are awarded if there are any syntactical errors in the script.

Last Update: 06.03.2025, Prof. Dr. Axel Löffler

[28] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88006 SPO-Version: 34

Statistics

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Axel Löffler
Modul Type	Mandatory Module
Academic Semester	3. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal: *none* Content: *none*
Use in other SG	
Language	English

Module Objectives

Professional Competence

Know That

The students are able to correctly **apply** the **technical vocabulary** in a given statistical context.
In addition, they are able to **quote** the **definitions** of the technical terms.

Know Why

The students are able to **provide examples** concerning the **definitions** of technical terms and the application of specific **methods**. Moreover, they are able to **explain why** the application of a specific method to a given problem is **effective**.

Know How

The students are able to **analyse** given problems, to **select** and **apply appropriate methods** to solve the given problems, thereby **adapting** the standard solution processes to problem specific needs.

Interdisciplinary Competence

The students are able to **self-organize their learning process**, including weekly **repetition of** and **reflection on** the course material, doing **additional exercises**, deepening their knowledge by **literature study** and **preparing questions** to the lecturer. Ideally, this takes place **in teamwork** with their co-students.

Course Content

Descriptive Statistics

Definitions of technical terms: population, subpopulation, **sample**, **variable**, **categorical** and **metric** scale levels.
Description of a given, **univariate data set** by means of **key figures** (e.g. mean, median, quantiles, range, standard deviation, inter quartile range, skewness and kurtosis, etc.), **tables** and **graphical visualisations** (e.g. bar-/pie-diagram, histogram, etc.) depending on the variable's scale level.
Bivariate statistics for categorical (contingency figures) and metric variables (correlation figures).

Probability Theory

Definitions of technical terms: **random experiment** and **probability**.
Basic principles (Kolmogorov's axioms), implications of the basic principles, visualisation by Venn diagrams, **conditional probabilities**, Bayes' theorem, theorem of total probability, properties of expected value and variance, **central limit theorem**, (discrete) **probability distributions** and (continuous) **probability density functions**.

Inductive Statistics (Inferential Statistics)

Definitions of technical terms: **confidence intervals** and **hypothesis testing**.
Basic inference tests: binomial test, chi2-test(s), t-test(s), analysis of variance, Levene-test.

Literature

L.E. Mee F.M. Dekking, C. Kraaikamp, H.P. Lopuhaä: A Modern Introduction to Probability and Statistics: Understanding Why and How, Springer Texts in Statistics, 2007

D. Spiegelhalter: The Art of Statistics: Learning from Data, Pelican Books, 2020

C. Wheelan: Naked Statistics: Stripping the Dread from the Data, Norton & Company, 2014

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[29]	SWS	CP
88301	Statistics	Prof. Dr. Axel Löffler	V, Ü	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[30]	Determination of Module Grades	Comments
88301	**PLK** – written exam (90 minutes)	100%	**40** of 90 points: passed (4.0) **80** of 90 points: excellent (1.0)

[29] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[30] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Requirements for Admission to the Module Exam
The students have to be **present at 75%** of the given courses up to the last date of signing off for the exam.
In addition, they have to **complete** the following **5 MatlabAcademy** self-paced **online courses**:
Matlab Onramp, Statistics Onramp, Optimization Onramp, Introduction to Symbolic Math (with Matlab), Introduction to Linear Algebra (with Matlab).

Further Study-Related Feedback
Feedback on questions and answers both from the students and the lecturer.

Comments
The exam takes place as an **online-written exam** using the **DigiExam** and **MatlabGrader**. The exam is **graded automatically**. The students may **run** their scripts **as often as they like** and **submit** them **5 times**.
Points are only awarded for correct assignments of variables. In particular, no points are awarded if there are any syntactical errors in the script.

Last Update: 24.06.2024, Prof. Dr. Axel Löffler

87010 SPO-Version: 34
Sensors and Data Acquisition

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Arif Kazi
Modul Type	Mandatory
Academic Semester	3. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Term
Credits	5 CP
Workload Class	75 Hours
Workload Self-Study	75 Hours
Participation Requirements	none
Use in other SG	Mechatronics Engineering
Language	English

Module Objectives

Professional Competence
Students are able to explain selected physical sensor principles with sensor technology and electronics. They can describe the basic structure of the respective sensor. They will be able to name the metrological properties of sensors and assess their advantages and disadvantages for the respective application. They will be able to select and use suitable sensors for the respective problem.

Interdisciplinary Competence
In the laboratory exercises in small groups, students are able to carry out tasks together and work as a team.

Course Content

Metrological properties of sensors
Basics of measurement data acquisition
Sensors Calibration
Potentiometric sensors
Strain gage sensors
Piezoresistive sensors
Galvanomagnetic sensors
Inductive sensors
Eddy current sensors
Capacitive sensors
Measurement amplifiers

Literature

Kazi, A.: *Sensors and Data Acquisition.* Lecture notes for the course
Fraden, J.: *Handbook of Modern Sensors: Physics, Designs, and Applications* (5th ed.). Springer (2016)
Czichos, H.: *Measurement, Testing and Sensor Technology.* Springer (2018)

Further literature:
Wilson, J.S.: *Sensor Technology Handbook.* Newnes/Elsevier (2004)

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[31]	SWS	CP
87303	Sensors and Data Aquisition	Prof. Dr. Arif Kazi	V,Ü	5	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[32]	Determination of Module Grades	Comments
87303	PLM (30 Minutes)	100%	

Requirements for Admission to the Module Exam

Further Study-Related Feedback

Comments

Last Update: 24.07.2024, Prof. Dr. Arif Kazi

[31] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[32] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88007 SPO-Version: 34

Engineering Mechanics 3

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Florian Wegmann
Modul Type	Mandatory Module
Academic Semester	3rd Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	90 Hours
Workload Self-Study	60 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence
The students are able to apply the basic methods in kinematics and kinetics of rigid bodies. They can model and analyze mechanical systems and are capable of assessing calculation results obtained with the aid of these models.

Interdisciplinary Competence
Students can apply the methods they have learnt independently. They are able to work on the exercises given in the lecture in small groups.

Course Content

- kinematics and kinetics of point masses
- kinematics and kinetics of rigid bodies
- impacts

Literature

- Gross/Hauger/Schröder/Wall: Engineering Mechanics 3 – Dynamics. Springer
- Hibbeler: Engineering Mechanics – Dynamics. Pearson
- Gross/Ehlers/Wriggers/Schröder/Müller: Dynamics – Formulas and Problems – Engineering Mechanics 3. Springer

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[33]	SWS	CP
88302	Engineering Mechanics 3	Prof. Dr. Florian Wegmann	V, Ü	6	5

[33] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[34]	Determination of Module Grades	Comments
88302	PLK (90 Minutes)	100%	

Requirements for Admission to the Module Exam
none

Further Study-Related Feedback
none

Comments
none

Last Update: 01.08.2024, Prof. Dr.-Ing. Florian Wegmann

[34] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88008 SPO-Version: 34

Machine Elements 1

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Alexander Kremer
Modul Type	Mandatory Module
Academic Semester	3. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	90 Hours
Workload Self-Study	60 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence

In this course, learn how to communicate effectively by beans of reading, understanding and drawing technical communication documents such as s. to represent components and assemblies with all the necessary details for production and assembly. They are able to apply the rules of technical drawing and create technical drawings independently. Furthermore, you will be able to design and depict sections, penetrations and represent them.

Furthermore, students will acquire basic knowledge about the calculation and design of machine elements and their integration into machines.

A further focus is on understanding the operating principles and areas of application of machine elements. Students will learn how to select individual machine elements according to customer requirements (specifications vs. functional specifications) and how to combine them sensibly to create a functional technical product.

In addition, methods and procedures for the design, construction and evaluation of technical products with regard to their service life and reliability are taught. Essential skills and ways of thinking that characterize the language of the engineer, such as the creation of sketches, technical drawings and the use of computer-aided programs (e.g., NX, Creo, KiSSsoft), are also promoted.

Interdisciplinary Competence

In addition, the course aims to develop your systematic, analytical and abstract thinking, promote your creativity and sharpen your technical and business judgment. In this way, you will be optimally prepared for the challenges of engineering practice.

Students will also develop their generic skills, particularly in the areas of interpersonal skills and independence. They will develop an awareness of the effects of failed machine elements, which will strengthen their sense of responsibility in terms of product liability and social responsibility.

Course Content The following topics are covered in the “Machine Elements A” module:

- Technical Drawing
- Fundamentals of Technical System Design
- Strength-based Design
- Fundamentals of Design for Connection Technology Elements: Adhesive Joints, Soldered Joints, Welded Joints, Riveted Joints.
- Bolted Joints
- Springs
- Bolts, Pins and Retaining Elements

Literature

Lecture notes
Mott, R. L.: Machine Elements in Mechanical Design, Pearson, ISBN: 978-0-13-507793-1, 2013.
Schmid, S. R; Hamrock, B. J.; Jacobson, H. B. O.: Fundamentals of Machine Elements, CRC Press, Taylor & Francis Group, ISBN: 978-0-42-9171291, 2013.
Wie, J.: Analysis and Design of Machine Elements, John Wiley & Sons, 2019.
Childs, P. R. N.: Mechanical Design Engineering Handbook, Elsevier Ltd., ISBN: 978-0-08-097759-1, 2014.
Narayana, K. L.; Kannaiah, P.; Venkata Reddy, K.: Machine Drawing, New Age international Publisher, ISBN: 978-81-224-2518-5, 2006.
Norton, L. R.: Machine Design, Pearson, 2011.
Collins, J. A.; Busby, H.; Staab, G.: Mechanical Design of Machine Elements and Machines, John Wiley & Sons, ISBN: 978-0-470-41303-6, 2010.
Juvinall, R. C.; Marshek, K. M.: Fundamentals of Machine Component Design, John Wiley & Sons, ISBN-13: 9781118012895, 2012.
Giesecke, F. E.; Mitchell, A.; Spencer, H. C.; Hill, I. L.; Dygdon, J, T.: Technical Drawing, Pearson Education (US); ISSBN: 978-0-13-461971-2, 1999.
Madsen, D.: Engineering Drawing and Design, Delmar Cengage Learning, ISBN: 978-1-305-65972-8, 2016.
Fritz; Hoischen: Technisches Zeichnen, Cornelsen, ISBN: 978-3-06-452487-3, 2024.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[35]	SWS	CP
88303	Introduction to Machine Elements	Prof. Dr. Alexander Kremer	V, L, Ü	5	5
88307	Technical Drawing	Prof. Dr. Alexander Kremer	V, Ü	1	

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[36]	Determination of Module Grades	Comments
88303	PLK (120 Minutes)	100%	Joint examination for both courses
88303	PLL	Not graded	During the semester

[35] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[36] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Requirements for Admission to the Module Exam

- Successful Completion of Assignments
- Successful Participation in Laboratory

Further Study-Related Feedback
none

Comments
none

Last Update: 03.12.2024, Prof. Dr. Alexander Kremer

88009 SPO-Version: 34

Thermodynamics and Fluid Mechanics

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Ingo Stotz
Modul Type	Mandatory Module
Academic Semester	3. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	90 Hours
Workload Self-Study	60 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence

The students are able to describe the fundamentals of thermodynamics and fluid mechanics and its basic concepts. They are able to describe and analyse state changes and technical processes using the appropriate physical equations. The students are capable to describe the behavior and properties of flows and can calculate both frictionless and frictional flows. They can apply the conservation equations of fluid physics.

The students can systematically break-down thermodynamic problems, perform required abstractions, and theoretically describe physical relationships using suitable models, thus developing the ability for physical modeling.

As a result, the students are capable of performing the thermodynamic assessment of thermal energy systems and evaluating their efficiency. Furthermore, they are able to incorporate thermodynamic and fluid mechanic aspects into development tasks and can utilize appropriate calculation methods.

Interdisciplinary Competence

The laboratory exercises are worked on in small groups as a team. As a result, the students are able to work together as a team and solve tasks in a team.

Course Content

- Thermodynamic fundamentals: thermodynamic systems, state quantities, changes of state, energy, work and heat
- The principles of thermodynamics for open and closed systems (first and second law of Thermodynamics: internal energy, enthalpy, entropy
- Substances and material laws: phase diagrams, equations of state and changes of state, real substances, the ideal gas
- Technical application of the laws of thermodynamics: adiabatic throttling, fluid energy systems (compression and expansion with losses), introduction to thermodynamic cycles, maximum work
- Properties and behavior of flows (viscosity, forces, stresses, pressures, density)
- Fluid statics (basic hydrostatic equation and its application)
- Description of flow processes (Eulerian and Lagrangian perspectives and streamline theory (Euler and Bernoulli equations for calculating frictionless flows)
- Conservation equations (mass and energy conservation, momentum equation)
- Fundamentals of frictional flows

Literature

- Reynolds, W. C., Colonna, P.: Thermodynamics – Fundamentals and Engineering Applications
- Cengel, Y., Boles, M., Kanoglu, M.; Thermodynamics: An Engineering Approach
- Moran, M., Shapiro, H., Boettner, D., Bailey, M.; Fundamentals of Engineering Thermodynamics
- Cengel, Y. A., Cimbala, J. M.: Fluid Mechanics - Fundamentals and Applications
- Spurk, J., Aksel, N.; Fluid Mechanics
- Weigand, B., Köhler, J., von Wolfersdorf, J.; Thermodynamik kompakt (German)
- Herwig, H.; Strömungsmechanik - Einführung in die Physik von technischen Strömungen (German)

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[37]	SWS	CP
88304	Thermodynamics and Fluid Mechanics	Dr. Ingo Stotz	V, Ü, L	6	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[38]	Determination of Module Grades	Comments
88304	PLK (120 Minutes)	100%	
88304	PLL	Not graded	During the semester

Requirements for Admission to the Module Exam
Participation in laboratory exercises (experiments and/or simulations) and submission of laboratory reports

Further Study-Related Feedback
-

Comments
none

Last Update: 07.08.2024, Prof. Dr. Ingo Stotz

[37] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[38] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88010 SPO-Version: 34

Manufacturing and Production Systems

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Tilman Traub
Modul Type	Mandatory Module
Academic Semester	3. Semester
Module Duration	1 Semester
Number LV	2
Offered	Winter Semester
Credits	5 CP
Workload Class	75 Hours
Workload Self-Study	75 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence
Students are able to name the most important manufacturing processes and the required tools and their possible applications. Students are able to assess the application limits and weigh up the advantages and disadvantages of the processes. They are able to select suitable processes for a specific component. They can transfer, execute, calculate, compare and evaluate the underlying structures of the subject area.

Interdisciplinary Competence
Students will apply the methods and knowledge they have learned in the course to current issues in small teams. As a result, they acquire the competence to engage in argumentative debate and are thus able to act independently.

Course Content

- Introduction to production technology
- The basic production techniques
  - Forming
  - Shaping
  - Cutting
  - Joining
  - Coating
  - Changing material properties
- Basic machine design

Literature

Course script

Additional references for further studies:

Fritz Klocke (Ed.): Manufacturing Processes (several issues), Springer, 2009-11

Michel Baudin, Torbjorn Netland: Introduction to Manufacturing. Routledge, 2023

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[39]	SWS	CP
88305	Manufacturing and Production Systems	Prof. Dr. Tilman Traub	V	4	5
88306	Manufacturing and Production Systems – Lab	Prof. Dr. Tilman Traub	L	1	

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[40]	Determination of Module Grades	Comments
88305	PLK (60 Minutes)	100%	

Requirements for Admission to the Module Exam
Successful participation of production systems – lab.

Further Study-Related Feedback
--

Comments
none

Last Update: 18.06.2024, Prof. Dr. Tilman Traub

[39] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[40] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88023 SPO-Version: 34
Machine Elements 2

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Alexander Kremer
Modul Type	Mandatory Module
Academic Semester	4. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	90 Hours
Workload Self-Study	60 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence

In this course, students will acquire basic knowledge about the calculation and design of machine elements and their integration into machines.

A further focus is on understanding the operating principles and areas of application of machine elements. Students will learn how to select individual machine elements according to customer requirements (specifications vs. functional specifications) and how to combine them sensibly to create a functional technical product.

In addition, methods and procedures for the design, construction and evaluation of technical products with regard to their service life and reliability are taught. Essential skills and ways of thinking that characterize the language of the engineer, such as the creation of sketches, technical drawings and the use of computer-aided programs (e.g., NX, Creo, KiSSsoft), are also promoted.

Interdisciplinary Competence

In addition, the course aims to develop your systematic, analytical and abstract thinking, promote your creativity and sharpen your technical and business judgment. In this way, you will be optimally prepared for the challenges of engineering practice.

Students will also develop their generic skills, particularly in the areas of interpersonal skills and independence. They will develop an awareness of the effects of failed machine elements, which will strengthen their sense of responsibility in terms of product liability and social responsibility.

Course Content

The following topics are covered in the “Machine Elements 2” module:

- Axles and Shafts
- Shaft-hub connections
- Bearings
- Seals
- Couplings
- Gears

Literature

Lecture notes
Mott, R. L.: Machine Elements in Mechanical Design, Pearson, ISBN: 978-0-13-507793-1, 2013.
Schmid, S. R; Hamrock, B. J.; Jacobson, H. B. O.: Fundamentals of Machine Elements, CRC Press, Taylor & Francis Group, ISBN: 978-0-42-9171291, 2013.
Wie, J.: Analysis and Design of Machine Elements, John Wiley & Sons, 2019.
Childs, P. R. N.: Mechanical Design Engineering Handbook, Elsevier Ltd., ISBN: 978-0-08-097759-1, 2014.
Narayana, K. L.; Kannaiah, P.; Venkata Reddy, K.: Machine Drawing, New Age international Publisher, ISBN: 978-81-224-2518-5, 2006.
Norton, L. R.: Machine Design, Pearson, 2011.
Collins, J. A.; Busby, H.; Staab, G.: Mechanical Design of Machine Elements and Machines, John Wiley & Sons, ISBN: 978-0-470-41303-6, 2010.
Juvinall, R. C.; Marshek, K. M.: Fundamentals of Machine Component Design, John Wiley & Sons, ISBN-13: 9781118012895, 2012.
Giesecke, F. E.; Mitchell, A.; Spencer, H. C.; Hill, I. L.; Dygdon, J, T.: Technical Drawing, Pearson Education (US); ISSBN: 978-0-13-461971-2, 1999.
Madsen, D.: Engineering Drawing and Design, Delmar Cengage Learning, ISBN: 978-1-305-65972-8, 2016.
Fritz; Hoischen: Technisches Zeichnen, Cornelsen, ISBN: 978-3-06-452487-3, 2024.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[41]	SWS	CP
88410	Applied Machine Elements	Prof. Dr. Alexander Kremer	V, L, Ü	6	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[42]	Determination of Module Grades	Comments
88410	PLK (120 Minutes)	100%	
88410	PLL	Not graded	During the semester

Requirements for Admission to the Module Exam

- Successful Completion of Assignments
- Successful Participation in Laboratory

Further Study-Related Feedback
none

Comments
none

Last Update: 03.12.2024, Prof. Dr. Alexander Kremer

[41] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
[42] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88011 SPO-Version: 34

Finite Elements, FEM

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Markus Merkel
Module Type	Mandatory Module
Academic Semester	4th Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Materials Science (Lecture) Engineering Mechanics 1 (Lecture) Engineering Mechanics 2 (Lecture. Lab) Mathematics 1 (Lecture, Practice) Mathematics 2 (Lecture, Practice)
Use in other SG	
Language	English

Module Objectives

Professional Competence:
The students are able to apply the FEM as an extension of matrix displacement methods in mechanics. They are able to describe the essential steps from the continuum through discretization and approximation to the main equation of the FEM. The students will be able to work on simple case studies using a commercial program system. This includes modeling the component geometry, meshing, introducing loads, boundary conditions and interpreting the results.

Laboratory development method:

The students are able to use FEM-Software. They can prepare models, carry out calculations and evaluate results qualitatively and quantitatively.

Interdisciplinary Competence:
The students are able to interact socially in exercises and case studies in small groups and to work in teams as well as independently.

Course Content

Basic equations of continuum mechanics, matrix methods, the principle of weighted residuals, main equation of the FEM, element formulations and methods for solving linear system equations.

Laboratory development method

Preprocessing: modeling of geometry, input of boundary conditions and loads,

carrying out simulation runs
Postprocessing: Presentation of results as plots and in diagrams.

Literature

- Zienkiewicz O.C., Taylor R.L., Zhu J.Z., Finite Element Method;
- Rao, S. S. (2011). The Finite Element Method in Engineering. Niederlande: Elsevier Science.
- Muftu, S. (2022). Finite Element Method: Physics and Solution Methods. Niederlande: Elsevier Science.
- Merkel, M., Öchsner, A. (2023). One-Dimensional Finite Elements: An Introduction To The Method. Deutschland: Springer Berlin Heidelberg.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[43]	SWS	CP
88401	Finite Elements, FEM	Prof. Dr. Markus Merkel	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[44]	Determination of Module Grades	Comments
88401	PLK 60 Minutes	100%	
88401	PLL (passed laboratory)	Not graded	During the semester

Requirements for Admission to the Module Exam
Passed exercises of the laboratory.

Further Study-Related Feedback

Comments
none

Last Update: 20.06.2024, Prof. Dr. Markus Merkel

[43] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[44] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88013 SPO-Version: 34

Dynamics of Machinery

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Moritz Gretzschel
Modul Type	Mandatory Module
Academic Semester	4th Semester
Module Duration	1 Semester
Number LV	2
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	
Use in other SG	
Language	English

Module Objectives

Professional Competence

The students can model the oscillation behaviour of linear single- and multi-mass systems with damping and excitation, and calculate and interpret natural frequencies and mode shapes. To do this, they can set up and solve equations of motion, determine rotational and translational mass forces and determine countermeasures such as static and dynamic balancing. To assess different excitation mechanisms, they can use the respective transfer functions for force and displacement. This means they are able to predict the time behaviour and to determine the transmission behaviour of the oscillatory system.

In the multi-body simulation laboratory, the students can work on tasks in groups of two. There they can develop physical models and create multi-body models of a small project under the guidance of the lecturer, calculate mode shapes and transient time behaviour and present the results in a structured manner in order to consolidate the theoretical knowledge they have learned.

Interdisciplinary Competence

The students can work on practical examples in teams of two and thereby apply communication and social skills.

Course Content Machine dynamics:

- Simulation and modelling
- Transient behaviour
- Unbalance excitation
- Vibration isolation
- Natural frequencies and mode shapes
- Modal analysis
- Multi-body dynamics
- Dynamic and static balancing
- Mass and force compensation for single-cylinder and in-line engines

Laboratory multi-body simulation:

- Design of physical models
- Programming of multi-body models
- Calculation of mode shapes and transient time behaviour
- Structured presentation of the results

Literature

[1] H. Dresig and F. Holzweißig. Dynamics of Machinery. Theory and Applications. Springer, 2010.

[2] M. Géradin and D. Rixen. Mechanical Vibrations. Theory and Application to Structural Dynamics. Wiley & Sons, Chichester, 3d edition, 2015.

[3] Pfeiffer, F., & Schindler, T. (2015). Introduction to dynamics. Springer.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[45]	SWS	CP
88403	Dynamics of Machinery	Prof. Dr. Moritz Gretzschel	V	2	5
88404	Laboratory Multibody Simulation	Prof. Dr. Moritz Gretzschel	L	2	

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[46]	Determination of Module Grades	Comments
88403	PLK (60 Minutes)	80%	
88404	PLL	20%	During the semester

[45] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[46] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Requirements for Admission to the Module Exam

none

Further Study-Related Feedback

none

Comments

none

Last Update: 06.08.2024, Prof. Dr. Moritz Gretzschel

88014 SPO-Version: 34

Process Automation and Control

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Tilman Traub
Modul Type	Mandatory Module
Academic Semester	4. Semester
Module Duration	1 Semester
Number LV	2
Offered	Summer Semester
Credits	5 CP
Workload Class	75 Hours
Workload Self-Study	75 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

General

Students are able to describe the basic structure of representative automation systems and can explain the basic application of sensors and actuators in this area. They can differentiate the different levels of the automation pyramid and can describe the structure, functions and limits of the individual levels.
Students can propose a concept for an information flow in open-loop control systems. They can apply the knowledge and methods to simple applications and derive the functional equations for automation tasks.

Students are able to apply the basic fundamentals of closed-loop control systems and can describe close loop control systems in time and frequency range. They are able to set the parameters of PID-controllers and estimate the behavior and remaining control deviation of the system based on the settings chosen.

Interdisciplinary Competence

Students are able to apply the methods and knowledge they have learned to current issues in small teams. As a result, they have the competence to engage in argumentative debate in the subject area and are thus able to act independently.

Course Content

- Basic structure of automation systems
- Basics and characteristics of open-loop control systems
- Methods for designing open-loop control systems and application
- Basics and characteristics of closed-loop control systems
- Methods for designing closed-loop control systems and application

Literature Course script

Additional references for further studies:

Kls Sharma: Overview of industrial process automation. Elsevier, 2017

Stamatios Maneis, George Nikolakopoulos: Introduction to Industrial Automation. CRC Press, 2018

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[47]	SWS	CP
88405	Process Automation and Control	Prof. Dr. Tilman Traub	V	4	5
88406	Process Automation and Control – Lab	Prof. Dr. Tilman Traub	L	1	

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[48]	Determination of Module Grades	Comments
88405	PLK (60 Minutes)	100%	

Requirements for Admission to the Module Exam
Successful participation of process automation and control – lab.

Further Study-Related Feedback
--

Comments
none

Last Update: 11.07.2024, Prof. Dr. Tilman Traub

[47] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[48] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88015 SPO-Version: 34

Polymer Materials and Plastics Processing

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Iman Taha
Modul Type	Mandatory Module
Academic Semester	4. Semester
Module Duration	1 Semester
Number LV	2
Offered	Sommer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	--
Use in other SG	
Language	English

Module Objectives

Professional Competence

Students can describe the structure and morphology of polymers and differentiate between the various types of polymers. They are able to link the respective structures with the property profile. Students can name the differences to other material structures and can classify the properties in comparison. In addition, they can explain the specific characteristics and fields of application of plastics and can give examples of some types of plastic and their application. Based on the requirements of the plastic end product, students can roughly name the commonly applied additives. Students can compare the opportunities and limitations of plastics and can categorize their role in a sustainable future.

Interdisciplinary Competence

Students are aware of their personal learning progress in the context of technical discussions and exercises and can deal with constructive and critical feedback based on this. They are able to present their own ideas and solutions concisely and to quickly grasp and categorize other people's solutions.
By introducing various examples relating to the everyday use of plastics, students sharpen their environmental awareness and strengthen their resource-conscious thinking. Students contribute examples and are able to discuss and evaluate the quality of statements in small and large groups.

Course Content

(Polymer Materials 1-8, Plastics Processing 9-15)

1. Historical development of plastic polymers
2. Structure of polymers
3. Types of bonding in polymers
4. Thermoplastics
5. Thermosets
6. Elastomers

7. Property profile and field of application of selected plastics
8. Fillers and additives
9. Basics in polymer rheology
10. Single screw extruders
11. Extrusion technology
12. Injection moulding
13. Film extrusion
14. Extrusion Blow Moulding
15. Thermoforming

Literature Lecture notes
Callister, Materials Science and Engineering: An Introduction, 10th Ed.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[49]	SWS	CP
88407	Polymer Materials	Prof. Dr. Iman Taha	V, L	2	5
88408	Plastics Processing	Prof. Dr. Tobias Walcher	V, L	2	

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[50]	Determination of Module Grades	Comments
88407	PLK (45 Minutes)	50%	
88408	PLK (45 Minutes)	50%	

Requirements for Admission to the Module Exam
Participation in Lab and Submission of Laboratory Report

Further Study-Related Feedback
None

Comments
none

Last Update: 16.06.2024, Prof. Dr. Iman Taha

[49] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
[50] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88016 SPO-Version: 34

Product Development

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Fabian Ferrano
Modul Type	Mandatory Module
Academic Semester	4. Semester
Module Duration	1 Semester
Number LV	1
Offered	Sommer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Completed modules: Engineering Mechanics 1 (static), Engineering Mechanics 2 (elasto static)
Use in other SG	
Language	English

Module Objectives

Professional Competence

Students are capable of planning, designing, developing, and testing technical components. They can conduct a preliminary market needs analysis, develop a product concept, and create a prototype where the material matches the functionality. During the project phase, they can manage time planning, resource allocation, and budgeting, as well as conduct risk assessments. They can perform quality control, identify and rectify errors, and make improvements. Students consider relevant legal aspects and safety guidelines during the development process and are capable of using environmentally friendly materials and sustainable production methods in product development.

Interdisciplinary Competence

Students can independently work on and solve application-oriented exercises. They enhance their ability to generate creative ideas. Moreover, they can consider economic, ecological, and social aspects in projects.

Course Content

- Introduction to the fundamentals of product development: significance of innovation, product lifecycle, market analysis, customer needs
- Idea generation and concept development: creativity methods, brainstorming techniques, idea generation, market needs analysis, concept development
- Prototype development: prototype manufacturing, material selection, and functionality
- Project management in product development: project planning, time management, resource allocation, budgeting, risk management
- Quality control and testing: quality management, testing, inspections, error correction, and product improvements
- Legal aspects and standards: product approval, patents, intellectual property, product conformity, and safety guidelines
- Sustainable product development: consideration of ecological and social sustainability, environmentally friendly materials, and manufacturing processes

Literature

Engineering Design: A Systematic Approach by Gerhard Pahl und Wolfgang Beitz, Springer Vieweg:
Product Development by Christopher A. Mattson, Carl D. Sorensen., Springer International Publishing:
Advances in Automation, Mechanical and Design Engineering by Giuseppe Carbone, Med Amine Laribi, Springer Nature Switzerland:

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[51]	SWS	CP
88409	Product Development	Prof. Dr. Fabian Ferrano	V, Ü, P	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[52]	Determination of Module Grades	Comments
88409	PLK 60 (60 Minutes)	60%	
88409	PLP	40%	During the semester

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback

Comments
none

Last Update: 06.03.2025, Prof. Dr. Fabian Ferrano

[51] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
[52] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88017 SPO-Version: 34

Light Weight Design

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Markus Merkel
Module Type	Mandatory Module
Academic Semester	6th Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	30 Hours
Workload Self-Study	120 Hours
Participation Requirements	
Use in other SG	
Language	English

Module Objectives

Professional Competence
The students are able to apply the fundamentals of lightweight design on engineering applications. They can plan and develop various lightweight concepts, utilize combinations of lightweight materials, and integrate these into their structures.

Interdisciplinary Competence
Students can work both independently and as part of a team. The students are able to classify their knowledge and skills within the framework of their subject area and sharpen their own professional profile. They achieve independence in focus orientation and social competence during lab and group exercises.

Course Content

Theoretical introduction to the field of lightweight design

Definition of project-based learning of a specific lightweight structure

Optimization of the chosen lightweight structure

Design concepts of the lightweight structure

Lightweight materials, Joining techniques, sandwich elements and failure modes in lightweight design.

Reasons and prerequisites for lightweight designing with homogeneous and heterogeneous material combinations.

Literature

- Ballo, F. M., Gobbi, M., Mastinu, G., Previati, G. (2020). Optimal Lightweight Construction Principles. Deutschland: Springer International Publishing.
- Technologies for Economic and Functional Lightweight Design: Conference Proceedings 2020. Deutschland: Springer, Imprint: Springer Vieweg, 2021.
- Material and Process Design for Lightweight Structures. (2019). Schweiz: Mdpi AG.
- Light-Weight Steel and Aluminium Structures: ICSAS '99. (1999). Niederlande: Elsevier Science.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[53]	SWS	CP
88602	Light Weight Design	Prof. Dr. Markus Merkel	L,P	2	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[54]	Determination of Module Grades	Comments
88602	PLP	100%	

Requirements for Admission to the Module Exam
None.

Further Study-Related Feedback

Comments
None

Last Update: 20.06.2024, Prof. Dr. Markus Merkel

[53] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[54] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88019 SPO-Version: 34

System Simulation

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Sebastian Feldmann
Modul Type	Mandatory Module
Academic Semester	6. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal: none Content: none
Use in other SG	
Language	English

Module Objectives

Professional Competence
Students are able to apply methods for object-oriented modelling of complex mechatronic systems and plants. Modelling is carried out in the Matlab/Simulink software system and on the basis of the object-oriented modelling language for physical models, Simscape. By using a self-balancing robot model they are able to use basic methods of discrete stochastic simulation, set up models and carry out experiments in the simulation environment.

Interdisciplinary Competence
The students are able to solve problems in working groups, using agile project management methods. They have team-building skills and the management skills in complex development projects and have gained experience with group dynamic processes. In addition, the ability to present technical work results in English is developed.

Specialised methodological skills:
Students are able to use advanced methods for object-oriented system design, modelling and simulation of complex systems in the field of mechanical engineering. In particular, they can apply systems thinking and advanced system design methodology.

Course Content

- Introduction to multidisciplinary system simulation
- Object-oriented modelling of dynamic systems with Matlab/Simulink and Simscape
- Variance reduction techniques
- Transferring CAD-models into simulation environments
- Virtual robot simulation, control and path planning
- Fundamental methods of control theory
- 3d animation and simulation of technical systems
- Methods for simulation runtime optimization
- Agile project management methods
- Technical english and presentation skills

Literature

Lecture notes

P. Beater: Modelling and Simulation of Technical Systems

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[55]	SWS	CP
88603	System Simulation	Dr. Sebastian Feldmann	V,P	2	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[56]	Determination of Module Grades	Comments
88603	PLP	100%	During the semester

Requirements for Admission to the Module Exam
none

Further Study-Related Feedback

Comments
none

Last Update: 08.08.2024, Prof. Dr. Sebastian Feldmann

[55] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[56] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88012 SPO-Version: 34
Additive Manufacturing

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Tilman Traub
Modul Type	Mandatory Module
Academic Semester	6. Semester
Module Duration	1 Semester
Number LV	1
Offered	Sommer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence

Students can calculate the costs of additive manufactured components and can compare these with other manufacturing methods. Students can discuss the advantages and disadvantages of additive manufactured components with those produced using other manufacturing methods.
Students are able to describe the process chain for manufacturing additive manufactured parts. They are especially able to design innovative components for additive manufacturing under consideration of existing process limits. Students are able to describe the special advantages of additive manufacturing in comparison to other manufacturing processes and can discuss the applicability of additive manufacturing for a given task. Students can use common software solutions in the design process of additively manufactured components and work independently on smaller project tasks.

Students are able to describe the basic and main technologies of Additive Manufacturing. This includes the functionality of various additive manufacturing processes including their basic technologies in accordance with DIN 8580 (e.g. sintering, joining,...) as well as the production of the material used and the resulting component properties.

Students can select a suitable additive manufacturing strategy for simple components and propose methods for testing component properties.

Interdisciplinary Competence

The students are able to work on the given tasks in small teams within and outside the tutorial.

Course Content

- Additive Manufacturing basic technologies
- Tool chain for additive manufacturing
- Design possibilities and limitations in additive manufacturing
- Industrial applications
- Research foci
- Advanced materials

Literature

Sanjay Kumar: Additive Manufacturing Processes. Springer, 2020

Tuhin Mukherjee, Tarasankar DebRoy: Theory and Practice of Additive Manufacturing. Wiley, 2023

Damir Godec, Joamin Gonzalez-Gutierrez, Axel Nodim, Eujin Pei, Julia Urena Alcazar (Editors) A Guide to Additive Manufacturing. Springer, 2022

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[57]	SWS	CP
88402	Additive Manufacturing	N.N.	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[58]	Determination of Module Grades	Comments
88402	PLK (60 Minutes)	100%	

Requirements for Admission to the Module Exam

--

Further Study-Related Feedback

--

Comments

none

Last Update: 18.06.2024, Prof. Dr. Tilman Traub

[57] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[58] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88020 SPO-Version: 34

Engineering Design

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Prof. Dr. Markus Kley
Modul Type	Mandatory Module
Academic Semester	6. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Formal:3D-CAX, Machine Elements 1 and 2, Product Development
Use in other SG	
Language	English

Module Objectives

General Methodology Competences
The students are able to tackle smaller design tasks systematically. It will be proven in various applications. They are able to abstract a design task and use intuitive and discursive methods to find a solution.

Professional Competence
The students are able to apply the basics of creating engineering product designs to concrete engineering design tasks on simple components of machines by integrating machine elements and simple sensors. They are able to plan the engineering process, analyze the task and thus design the product development process.

Interdisciplinary Competence
Through group work, the students are able to solve a task in a team and act as a team. The students are able to tackle tasks systematically. They are able to abstract a task and use intuitive and discursive methods to find a solution.

Course Content

Product development exercises, containing
the engineering design area
the process of planning and engineering design/construction
product planning and task clarification
methods for designing (functional structures, finding solutions, creativity techniques, ...)

Literature

Engineering Design - A Systematic Approach third edition; Springer; Authors: Gerhard Pahl , Wolfgang Beitz , Jörg Feldhusen , Karl-Heinrich Grote
VDI 2221, VDI 2222, VDI 2223

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[59]	SWS	CP
88604	Engineering Design	Dr. Markus Kley	P, Ü	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[60]	Determination of Module Grades	Comments
88604	PLP	100 %	During the semester

Requirements for Admission to the Module Exam
Successful completion of all practical training testats
Successful completion of Design-Review presentation

Further Study-Related Feedback
Regularly Feedback on Group Work

Comments
Not graded; course strongly relates to module 59905

Last Update:06.03.2025, Prof. Dr. Markus Kley

[59] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[60] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88555 SPO-Version: 34

Placement Semester / Internship

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Head of internship office (Praktikantenamtsleiter)
Modul Type	Mandatory Module
Academic Semester	5. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	30 CP
Workload Class	900 Hours
Workload Self-Study	Hours
Participation Requirements	general SPO (BA-AT) will apply
Use in other SG	
Language	English

Module Objectives

Professional Competence
Students are able to independently and autonomously solve practical problems in in engineering or value-adding industrial activities, taking into account the specific work on specific operational conditions. They can proceed systematically in order to use technical and economic solutions in practice apply them.

Interdisciplinary Competence
Students are able to integrate into an existing team and are motivated to make their own contributions within a working context. They can communicate effectively with other people and have a sense of responsibility, to work flexibly, consensually and in a task-oriented manner in day-to-day dealings.
They are able to consider economic, ecological, safety and ethical aspects in their work.

Course Content

Depending on the choice of the company for the placement semester/internship.

It is strongly recommended that all students attend one of the introductory events offered by the central internship office between the 4th and 10th week of each semester. Students can participate in an semester prior to the internship. The event will provide additional information for the organizational procedure of the internship semester and provide additional tips. Attendance is neither certified nor is it part of the examination performance.

Students are obliged to prepare a report on their internship. The guidelines for the internship semester report are an integral part of the module description and define the requirements for the internship semester report. In the semester following the placement semester, there will be a mandatory date at which students present their internship reports. Participation is mandatory and part of the examination performance.

Literature none

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[61]	SWS	CP
88555	Practice in a Company (110 attendance days in the company)	none			30
88555	Placement report (according to guidelines)*				

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[62]	Determination of Module Grades	Comments
88555	PPR	ungraded	

Requirements for Admission to the Module Exam
none

Further Study-Related Feedback
none

Comments
-

Last Update: 06.03.2025, Prof. Dr. Tilman Traub

[61] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[62] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88880-88885 SPO-Version: 34

Option: International Semester – 6 Module

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Dean of Studies Prof. Dr. Tilman Traub
Modul Type	Option: complete international semester with 6 Modules
Academic Semester	6. Semester
Module Duration	1 Semester
Number LV	Module dependent
Offered	Summer Semester
Credits	30 CP (each module 5 CP)
Workload Class	Module dependent
Workload Self-Study	Module dependent
Participation Requirements	Formal: *Learning agreement*
Use in other SG	
Language	English

Module Objectives

Professional Competence
The students can set their own specialisations and develop an individual skills profile during a semester abroad. In addition, they can acquire global expertise through the semester abroad.

Interdisciplinary Competence
The students acquire intercultural skills in particular and are thus able to react in an interculturally sensitised manner in later work situations. They can also strengthen their self-organisation.

Course Content
The content is determined by the Learning Agreement between the coordinating institutions.

Literature
Module dependent

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[63]	SWS	CP
88607-88612	International EME 1-6		Module dependent	4 each	5 each ∑ 30

[63] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[64]	Determination of Module Grades	Comments
88607-88612	Module dependent	Module dependent	The examination is determined by the Learning Agreement between the coordinating institutions.

Requirements for Admission to the Module Exam: -

Further Study-Related Feedback: -

Comments: -

Last Update: 17.06.2024, Prof. Dr. Tilman Traub

[64] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88999 SPO-Version: 34

Project

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Dean of Studies Prof. Dr. Tilman Traub
Modul Type	Mandatory Module
Academic Semester	7. Semester
Module Duration	1 Semester
Number LV	1
Offered	Sommer Semester
Credits	5 CP
Workload Class	30 Hours
Workload Self-Study	120 Hours
Participation Requirements	
Use in other SG	
Language	English

Module Objectives

Professional Competence:
Students can work on a task independently and comprehensively and solve specific tasks and questions using engineering procedures. The working method is designed in such a way that the student first narrows down the problem and then finds a solution.
During excursions, students gain insights into project work in different companies. They are able to transfer these learnings to their own project work.

Interdisciplinary Competence:
Students can contribute to the team and communicate in an appropriate manner if the project topic is designed in such a way that it is possible to structure it between the sub-areas.
They are able to work on a project and solve problems that occur in connection with a project.

Course Content From the thematic environment of the course content

Literature technical: to be discussed with supervisor

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[65]	SWS	CP
88601	Project	Professors of the degree program	P	2	5

[65] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[66]	Determination of Module Grades	Comments
88601	PLP	100%	

Requirements for Admission to the Module Exam
Participation in at least three excursions during the course of study is a prerequisite for the credit.

Further Study-Related Feedback
--

Comments
The project is completed with the submission of the project.
A supervisor and the topic must be sought by the student from the professors

Last Update: 06.03.2025, Prof. Dr. Tilman Traub

[66] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88999 SPO-Version: 34
Studium Generale

Course of studies	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module name	Studium Generale
Module Coordinator	Dean of Studies
Module type	Compulsory module
Semester	7. Semester
Duration	During the study
No. of lectures	
Begin of offer	Winter semester, Summer semester
Credits	3 CP
Workload Contact time	90 hours
Workload Self study	hours
Admission requirement	--
Relevance in courses of study	
Language	English

Learning goals / competence

The comprehensive education of students is expanded by courses from the Studium Generale. These courses complement the respective degree with interdisciplinary subjects. The programme enables students to deal with general scientific subjects and current topics.
Students acquire essential qualifications relevant for their later professional life. Volunteering is encouraged to build on the social skills of students.

Professionalism
Students are able to present complex interdisciplinary subjects and can assess their relationships. They are able to deal autonomously with socio-political questions.

Interdisciplinary skills
Depending on their choice of courses, students improve their teamworking skills, their time and/or conflict management or their presentation skills. Students are enabled to apply attained skills as requested.
Students acknowledge the significance of voluntary commitment to personal development and to society.

Lecture contents

Various courses and events are offered as part of the General Studies. Each semester has a thematic focus. The respective course content is flexible and can therefore be taken from the respective program created every semester.
The courses can be attended by students at any time during their studies, but at the latest in the last semester.
In order to count the corresponding hours and credit points, a collection sheet of the workload performed as well as a written report on the completed courses must be submitted. Alternatively, voluntary or civil society commitment during studies can be performed, documented and credited. Corresponding information can be found in the “Aalen University Guidelines of the General Studies and the Achievement of Social Competence“.

Literature

Depending on choice of courses

Courses / lectures (LV)

Course no.	Title of the course / lecture	Lecturer	Type[67]	SWS	CP
88999	Depending on choice of courses				3

Module exam

Course no.	Type / length[68]	grading	Comments
88999	PLS	Not graded	Report

Admission requirement

—

Comments:

Last updated: 06.03.2025, Prof. Dr. Tilman Traub

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

9999 SPO-Version: 34

Bachelor Thesis

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Dean of Studies Prof. Dr. Tilman Traub
Modul Type	Mandatory Module
Academic Semester	7. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	12 CP
Workload Class	
Workload Self-Study	360 Hours
Participation Requirements	See SPO
Use in other SG	
Language	English

Module Objectives

Professional competence:
Students can work on a task independently and comprehensively and solve specific tasks and questions using engineering procedures. Independent processing and solution of a given task from the problem definition and literature research to analysis, physical interpretation and presentation of the results. The working method is designed in such a way that students are first able to narrow down the problem and to develop adequate solution methods and tools. The work should not be one-sided and in-depth, but should solve the task in consideration of the relevant boundary conditions.

Interdisciplinary competence:
Students can contribute to the team and communicate in an appropriate manner.

Special methodological competence:
They know the basic procedure for solving problems.

Course Content

From the thematic environment of the course content

Literature

- Technical: to be discussed with supervisor
- Organizational: Handout of the degree program (available online)

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[69]	SWS	CP
9999	Bachelor Thesis	Professors of the degree program	P		12

[69] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[70]	Determination of Module Grades	Comments
9999	*PLP*	100%	two supervisors (to be sought by students)

Requirements for Admission to the Module Exam
--

Further Study-Related Feedback
--

Comments
--

Last Update: 17.06.2024, Prof. Dr. Tilman Traub

[70] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

88021,88022,88024,88025 SPO-Version: 34

Elective Module 1 – 4

Degree Program	Mechanical Engineering – Bachelor of Engineering (B.Eng.)
Module Manager	Dean of Studies Prof. Dr. Tilman Traub
Modul Type	Mandatory Module
Academic Semester	6./7. Semester
Module Duration	1 Semester
Number LV	Module dependent
Offered	Summer Semester / Winter Semester
Credits	5 CP
Workload Class	Module dependent
Workload Self-Study	Module dependent
Participation Requirements	Formal: Module dependent Content: Module dependent
Use in other SG	
Language	English

Module Objectives

General
Module dependent

Professional Competence
Module dependent

Interdisciplinary Competence
Module dependent

Course Content The content is determined by the selected module

Literature Module dependent

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[71]	SWS	CP
	Elective Module Depending on choice of course According to the list of electives announced at the beginning of the semester?		V, L, Ü, P …	4	5

[71] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[72]	Determination of Module Grades	Comments
	According to the module selected from the list of electives announced at the beginning of the semester	Module dependent	The examination is determined by the selected module

Requirements for Admission to the Module Exam
Module dependent

Further Study-Related Feedback
Module dependent

Comments
none

Last Update: 17.06.2024, Prof. Dr. Tilman Traub

The following are examples of module descriptions for compulsory elective subjects

In good time before the start of each semester, the degree program publishes a list of the modules offered in the compulsory elective area.

[72] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*