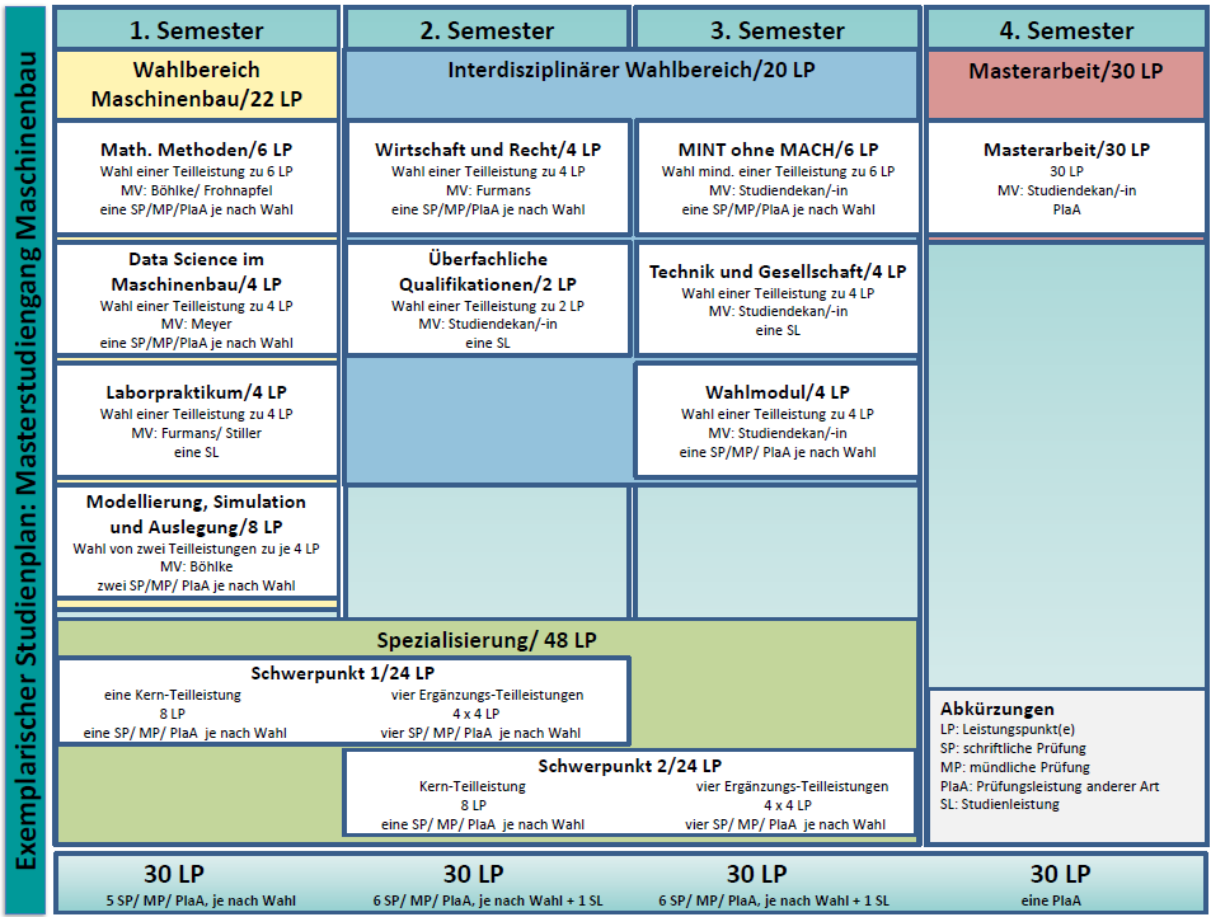
Master Mechanical Engineering SPO 2025

New study and examination regulations for the Master's in Mechanical Engineering will come into force in summer semester 2025. The module handbooks for this degree program will be available approx. 6 weeks before the start of lectures. The most important information on the curriculum is summarized below.

Examplary Curriculum:



Qualification goals of the moduls:

Electives Mechnical Engineering
Mathematical Methods Students will deepen and explain mathematical methods and transfer them to a variety of engineering problems. They are able to select suitable methods and transfer them to new problems.
Data Science in Mechanical Engineering Depending on the course chosen, students develop different skills in this module. What all courses have in common is that they promote data literacy in mechanical engineering. The students can...

- apply advanced algorithms and methods from the fields of machine learning, data analysis or computational intelligence to real engineering and mechanical engineering problems
- use relevant software tools and programming environments, such as Python or high-performance computing tools, to solve complex data-driven problems.
- acquire, cleanse and transform data from different sources, as selected, to prepare it for analytical and machine learning processes.
- evaluate and compare the performance and accuracy of different models and algorithms using suitable metrics and, if necessary, identify weaknesses and optimization potential.
- critically evaluate the suitability and efficiency of various methods and tools from the field of data science in specific engineering and mechanical engineering contexts.

Laboratory Course

Students are able to:

- model typical problems in the laboratory and use typical methods of mecanical science to inquire,
- built experiment designs, while choosing appropriate system components and models,
- accomplish experiments goal-oriented,
- analyse and evaluate results of experiments.

Modeling, Simulation and Design

In the module, methods of modeling, numerical simulation and the design of systems and processes are presented in a networked manner. Students acquire in-depth knowledge of how a model can be constructed, discretized and used to design components or processes. Students are then able to select modeling and solution methods for engineering problems and use them for design. After completing this module, students will be able to critically evaluate modeling approaches and simulation methods against the background of an initial problem.

Interdisciplinary Electives

Economics and Law

Students can enlarge their knowledge about law and economics which affect mechanical engineering self-determined. They are able to describe circumstances of the case considering law or economics and apply it to simple cases. Later on in work life, they are able to evaluate, if and which subject specific support is necessary.

STEM without Mechanical Engineering

After completing the elective module "Wahlpflichtmodul" the attendants are able to extend their knowledge in the field of mechanical engineering in the disciplines natural sciences, electrical engineering or the informatics. The attendants are aware of typical approaches in fields, that differ sufficiently from mechanical engineering and know specific methods and fundamentals of these fields. Thus, the attendants are able to solve interdisciplinary problems by applying this knowledge and to adopt specialist skills by themselves later.

Key Competencies

After completing the module Key Competences students can

- determine and coordinate work steps, projects and goals, proceed systematically and purposefully, set priorities as well as assess the feasibility of a task,
- apply the principles of safeguarding good scientific practice,
- apply methods for the planning of a specific task under given framework conditions in a goal- and resource-oriented way,
- describe methods for scientific research and selection of technical information according to pre-established quality criteria and apply them to given problems,
- discuss empirical methods and apply them to selected examples,
- present technical information in a clear, readable, and convincingly argued manner in various forms of presentation (e.g. poster, exposé, abstract) in writing and appropriately visualize it graphically (e.g. engineering drawings, flowcharts),
- present and stand up for technical content in a convincing and appealing way,
- work as a team in a task-oriented manner, handle any conflicts on their own and take responsibility for themselves and others,
- communicate as a team in an objective, goal-oriented and interpersonal manner, represent their own interests, reflect and take into account the interests of others in their own words, and successfully organize the course of the conversation.

Technology and Society

In this module, students gain an understanding of the interplay between technology and society. They are enabled to assess, critically question and evaluate the consequences of their decisions and actions on society and the environment, thus acquiring ethical reflection skills. For example, they can determine the benefits and risks of new technologies and carry out a technology assessment, recognize the emergence of innovation and communicate science and research with various groups from outside the field.

Elective Module

Students deepen their knowledge in selected areas of mechanical engineering. Due to the large selection of courses, they have individually and precisely supplemented and sharpened their own skills profile in mechanical engineering. The specific learning objectives are agreed with the respective course coordinator.

Specialization

In the specialization, 2 focus areas can be chosen according to individual inclination. The following options are available:

- Systems and Machines in Energy and Power Plant Engineering
- Drive Systems for Mobile and Stationary Applications
- Computational and Applied Mechanics
- Dynamics and Control
- Fundamentals and systems of energy technology
- Vehicle Technology
- Fundamentals and Applications of Thermodynamics
- Engineering Design of Mechatronic Systems
- Structural Materials
- Lightweight Engineering
- Microsystems Technologies
- Production Technology

- Product Development
- Robotics & AI
- Fluid Mechanics
- Supply Chain Technologies
- Material-Oriented Technologies

The specific learning objectives depend on the chosen specialization.

Master's Thesis

The student is able to work independently on a defined, subject-relevant theme based on scientific criteria within a given period of time. The student is able to do research independently, to analyze information, to abstract as well as collect and recognize basic principles and regularities on the basis of less structured information. He/she overviews the given scientific question, is able to choose sophisticated scientific methods and techniques, and use them to solve this question and to identify further potentials, respectively. In addition, this will be carried out in consideration of social and/or ethical aspects.

The student can interpret, evaluate, and if needed plot the results obtained in a more sophisticated way. He/she is able to clearly structure his scientific work and (a) to communicate it in written form using state-of-the-art technical terminology as well as (b) to present it in oral form and discuss it with experts.