

Degree: Bachelor of Engineering (B.Eng.)

Mechanical Engineering & Digital Technologies



Mechanical engineers shape industrial progress by developing systems and machines that enhance our lives.

The Bachelor's programme "Mechanical Engineering & Digital Technologies" at FOM University of Applied Sciences responds to global industry demands, combining fundamental engineering with digital technologies in product development and production processes.

Students learn about industrial data management, production process simulation, and digital twins co-development. Graduates gain skills in networked production, mechanical and plant engineering, automotive, chemical, and environmental technologies.

The Bachelor's programme "Mechanical Engineering & Digital Technologies" is taught entirely in English and will be completed with the academic degree Bachelor of Engineering (B.Eng.).

Support for all issues relating to your study

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Monday to Friday from 9:00 a.m. to 4:00 p.m. German time

E-Mail: Send us an email to: incomings@fom.de

More information
on the degree programme



Location

Essen

Duration

6 semester

Credit Points

180 ECTS

Accreditation

The FOM University of Applied Sciences is accredited by the German Council of Science and Humanities and was the first private university in Germany to be system-accredited by FIBAA in 2012. This means that all FOM degree programmes are state and internationally recognised.

Total costs

25,830 euro including registration fee, tuition fee and examination fee

Your career prospects

You can take on the following jobs:

Mechanical Engineer
Digital Manufacturing Engineer
Robotics Engineer
Technical Consultant
Aerospace Engineer

1st semester

Engineering Mathematics I (6 CP)

- Foundations and introduction to MATLAB/Octave
- Sequences and series
- Differential calculus
- Integral calculus
- Linear algebra

Modern Materials and Operating Supplies (6 CP)

- Fundamentals of metallic and non-metallic construction materials
- Steels
- Non-ferrous metals: aluminium, magnesium, titanium (light metals), heavy metals
- Plastics (thermoplastics, thermosets, elastomers)
- Composite materials and their use in mechanical engineering and transportation
- Functional materials: magnetics materials, conductive materials, semiconductors
- Material testing (destructive, non-destructive)
- Sustainable materials (including recycling) of materials and supplies

Industrial IT Operating Systems and Networks (6 CP)

- Operating systems
- Process management and memory management
- File systems
- Networks
- Data protection and data security

Industrial Software Development (5 CP)

- Programming concepts
- Programming paradigms
- Languages and tools
- Algorithms

Time and Self Management (5 CP)

- Time management
- Self-optimisation methods (i.e. Pareto principle, ABC-Analysis)
- Learning checks

2nd semester

Engineering Mathematics II (6 CP)

- Fourier series
- Linear Algebra II
- Derivative
- Ordinary differential equations

Technical Mechanics (6 CP)

- Basic concepts of statics: forces and their decomposition; force pairs, torsional and bending moments
- Equilibrium conditions
- Locating the centre of mass
- Bending stress
- Rigid body dynamics

Laboratory training course (6 CP)

- Pendulum swing
- Electrical measurements
- Temperature measurement
- Torque
- Practical introduction to control engineering measuring, monitoring and controlling using smartphones and embedded systems

Metrology (5 CP)

- Fundamentals of physics and sensor technology
- Measurement chain modelling
- Temperature sensors
- Kinematic and dynamic measurement
- Fluid measurement technology
- Sensors systems

Scientific Working Methods (5 CP)

- Research design
- Basic formal requirements
- Research methods

Project Management (5 CP)

- Stakeholder analysis
- Risk management
- Scheduling and resource planning
- Agile project management

3rd semester

Natural Sciences for Engineers (6 CP)

- Vibrations and waves
- Electromagnetic waves
- Elementary quantum physics
- Structure of matter
- Elementary chemistry

Fundamentals of Construction & Machine Elements (6 CP)

- Structure of technical drawings
- Construction basics
- Strength, static and dynamic component verification
- Clutch, gear and breaks fundamentals

Fluid Mechanics (6 CP)

- Basic concepts of fluid mechanics
- Hydrostatics
- Hydrodynamic foundations of ideal fluids
- Pipe flow
- Potential flow

Applied Engineering Mathematics (5 CP)

- Tensors
- Autonomous Systems
- Complex functions
- Integral transforms
- Basic terms in calculus of variations
- Production planning and control

Digital Transformation (5 CP)

- Digital Business & Business Models
- Trend analysis
- Innovation (Lean Startup, Design Thinking etc.)
- Pitching

ESG-Sustainability (5 CP)

- History and definition of ESG and sustainability
- Dimensions of sustainability
- Corporate Social Responsibility
- Interculturality and diversity

4th semester

Industrial Data Engineering (6 CP)

- Data in Industry 4.0
- Data collection and transfer
- Data quality and data security
- Foundations of quantitative data analysis
- Correlation analysis
- Statistical experiment design
- Methods and software solutions for machine learning

Electrical Engineering & Microsystem Technology (6 CP)

- Direct current technology
- Fundamentals of the electromagnetic field
- Introduction to semiconductor and microsystems technology

Dynamics & Robotics (6 CP)

- Kinematics of mass points
- Robot kinematics
- Kinetics of mass points
- Oscillation

Project: Construction & Computer Aided Design (5 CP)

- Coordinate systems
- Perspectives
- Building components and assembly structure

Product Innovation & Service Engineering (6 CP)

- Tasks of innovation and technology management
- Innovation strategies
- Creativity and problem solution strategies
- Role of services in the context of digitalisation
- Service quality and management

5th semester

Process Optimisation & Quality Management (6 CP)

- Introduction to quality management and its transformation to Quality 4.0
- Norms and rules for quality management (QM)
- Establishment and planning of a QM system
- Risk management/advanced product quality planning methods
- Software solutions for quality 4.0

Production Processes & Production Technology (6 CP)

- Foundations of production theory and production systems
- Role of safety, environmental protection and regulations
- Foundations of processes (process engineering, chemical reaction engineering and environmental engineering)
- Modes of operation (batch-processing, continuous production, joint production)
- Industrial manufacturing process in metalworking and plastics industry
- Additive manufacturing processes
- Sustainability in the manufacturing process

Thermodynamics (6 CP)

- Energy, work, heat, temperature ideal gases and pure substances real fluids heat conduction convection component design

Actuators, Drives & Power Units (5 CP)

- Electrical machines
- Internal combustion engines
- Hydraulics and pneumatics
- Overarching aspects (i.e. energy conversion efficiency, fouling)

Smart Factory (6 CP)

- Introduction to digitised production
- IT systems in production and their significance for the Digital Twin.
- Technologies and their application in smart factories (i.e. cloud computing, AI, cellular technology)
- Sustainability aspects in the smart factory
- Technology implementation challenges and the shift towards smart factories

6th semester

Digital Automation Technology (6 CP)

- Controls (SPS/PLC; IPC)
- Digital control engineering
- Communication networks
- Applications of industrial bus systems and networks
- Cyber-physical systems

Project: Certificate Quality Management (5 CP)

- Foundations of quality management and certification
- Case study structure
- Asynchronous group work on selected case studies

Exposé (5 CP)

- Formal, methodological and content requirements in academic research and writing
- Identifying research problems and developing a research question
- Developing and presenting a research plan

Bachelor's Thesis and Colloquium/Defence (12 CP)

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