Courses are taught in German unless it is specifically stated that the language of instruction is English.

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1. Compulsory Modules in the 1st Semester

**Mathematics I**

Learning objectives / competencies:

The overall objective of the course is for students to acquire important skills in scientific computing in technical and economic disciplines.

By the end of the course students will:

- Be confident in using the most basic mathematical functions graphically.
- Have an understanding of curves in Cartesian and polar coordinates.
- Have mastered differential calculus for the above mentioned functions and function types.
- Know how to approximate functions using polynomials and be able to solve simple extreme value problems.
- Have an understanding of functions that depend on several variables.
- Be able to partially differentiate and know how to transfer the derivatives of functions of one variable to functions of several variables.
- Know the basic primitives and have mastered the most important principles and techniques of integral calculus.
- Have mastered arithmetic with vectors and understood the geometric ideas behind various mathematical operations.
- Have a clear idea of scalar and vector fields and have mastered differential calculus in relation to these.

In particular, students will learn about the typical applications of the topics mentioned above.

Course content:

- Functions and curves
- Differential calculus for functions of one variable
- Taylor expansion
- Differential calculus for functions of several variables
- Integral calculus
- Vector algebra and vector analysis
Engineering Mechanics

Learning objectives / competencies:

By the end of the course students will:

- Be aware of the forces and moments in simple solid-state systems.
- Know how to determine forces and moments in mounting points and the impact of forces on substructures.
- Understand friction situations in technology.
- Be able to calculate the barycentre of bodies.
- Be able to determine the internal forces of subsystems (stresses) and their impact (strains).
- Understand the variables that influence static and dynamic component strength.
- Be able to demonstrate the strength of components in linear and simple compounded strain cases.

Course content:

- Summary of forces to resultants
- Bearing of bodies and application of the cutting principle
- Systems in balance
- Coulomb static and dynamic friction
- Relationship between stress and strain on material law
- Effects of traction/strain, bending, shear and torsion
- Practical application of the strength of materials: static and dynamic strength analysis of components
Chemistry and Materials

Learning objectives / competencies:

Technical Chemistry

By the end of the course students will:

- Know the atomic structure of substances.
- Understand stoichiometric relationships and be able to perform simple calculations.
- Understand equilibrium reactions and electrochemical processes and their influence.
- Know the basic organic substances and reaction types.
- Understand the basics of thermodynamics.

Introduction to Materials Science

By the end of the course students will:

- Understand the importance of and working areas in materials technology.
- Know the main material groups and be able to cite examples of them.
- Understand the preparation, properties and applications of ceramic and polymeric materials.

Course content:

- Technical chemistry
- Atomic structure and periodic system
- Chemical bonds
- Chemical equilibrium
- Electrochemistry
- Basics of organic chemistry
- Introduction to materials science
- Technical ceramics
- Polymeric materials
Technical Drawing

Learning objectives / competencies:

By the end of the course students will:

- Be familiar with the technical norms for drawings.
- Be able to represent the body in three-dimensional views.
- Understand the principles behind toleration of component measures, shape and position tolerances and the ISO fitting system.
- Understand the relationship between required quality and costs.
- Be able to create simple technical drawings independently and manually for the manufacturing and assembly of products, mainly in mechanical engineering.
- Be able to create simple BOMs.
- Be able to identify the function of illustrated devices, groups of machines and machines in general in assembly drawings.

Course content:

- Basis norms for technical drawings
- The three panel projection
- Measurement registrations and principles of toleration
- The ISO fitting system and data of surface qualities
- Representation of standardized components
Business Administration

Learning objectives / competencies:
By the end of the course students will:

- Be familiar with the economic aspects of specific topics in the current business press.
- Have learnt about the relevant relationships between businesses and the environment in terms of making corporate management decisions.
- Understand the key business processes and operational functions of service provision and utilization.
- Understand the functions of operational cooperation within a company and cross-functional management.

Course content:

- Constitutive decisions (choice of legal form of the company and site, cooperation and concentration forms).
- Corporate activities and business indicators (productivity, efficiency, profitability, liquidity).
- Business processes and basic functions of operational service provision and utilization.
- Management and cooperation of value added processes in the circulation of macroeconomic goods and money.
- Defining market and corporate developments.
Basics of Computer Science

Learning objectives / competencies:

By the end of the course students will:

- Have learnt the methods used in engineering-based problem solving.
- Be able to solve simple technical and economic problems using algorithms.
- Know how to program using basic imperative programming language.

Course content:

- Solving engineering-based problems in technology and economics by programming in a modern programming language or in a programming-related way.
- Basics of data processing to establish a comparable level of knowledge regarding the current state of development in computer science and information technology.
- VBA programming with Microsoft Office as an introduction to programming and the VB programming development environment.
- Declaring variables and constants.
- Basic and structured data types in Visual Basic.
- Basic in/output and print output programming.
- Elementary arithmetic using Visual Basic.
- Testing and failure analysis, the VB debugger, documentation.
- Basic principles of structured programming, creation of simple structure charts.
- Programming of control structures in Visual Basic.
- Programming subroutines in Visual Basic.
- Introduction to object-oriented programming with Visual Basic by creating a simple graphical user interface.
- File handling in VB.
- Introduction to number systems and coding, the binary system, hexadecimal representation and basic computer arithmetic.
- The application of VB in specific subject areas in technology and economics.
2. Compulsory Modules in the 2nd Semester

Mathematics II

Learning objectives / competencies:

By the end of the course students will:

- Be able to solve linear equations systematically and have mastered the basic techniques of arithmetic with matrices.
- Be able to use complex numbers in the different display options confidently and understand the difference between real and complex functions.
- Know how to interpret a double or a triple integral, solve them computationally in Cartesian and polar coordinates and be able to describe integration areas in the above mentioned coordinate systems.
- Be familiar with the tools used to visualize the solution behaviour of ordinary differential equations, know how to assign them to their respective class and be able to solve them using the relevant procedures.
- Understand the principle of integral transformation and know how to use the Laplace and Fourier transformations in appropriate application areas.

In particular, students will learn about the typical applications of the topics mentioned above.

Course content:

- Matrices and linear systems of equations
- Complex numbers and functions
- Integral calculus for functions of several variables
- Differential equations
- Laplace transformation
- Fourier transformation
Physics with Practical Training

Learning objectives / competencies:

By the end of the course students will:

- Understand the importance of physics as the scientific basis for the work of engineers.
- Know the basic laws of physics and have the ability to proof technical applications in terms of physical laws.
- Have an understanding of physical-technical issues, such as problem identification, problem formulation by applying the basic laws of physics, translation into mathematical language.
- Be able to perform simple laboratory tests, record and evaluate measurement data, present their results and interpretations in a written report that has to meet the stylistic demands of a scientific publication.

Course content:

- Mechanics: kinematics and dynamics of particles and rigid bodies
- Thermodynamics: state quantities and changes of state of ideal and real gases
Material Engineering

Learning objectives / competencies:

By the end of the course students will:

- Understand the structure of metallic materials and the significance of errors in their structure.
- Understand the mechanisms of elastic and plastic deformation and recognize the importance of the influence of deformation properties on metals.
- Understand the mechanisms that lead to the equalization of concentration differences and understand the changes of state when adding alloying elements.
- Know the basics of manufacturing metallic materials in construction.
- Understand the properties of iron-based materials, light metals and copper-based materials and know about their essential applications.
- Be able to influence the properties of materials by applying suitable and thermal treatments.
- Be familiar with the most important selection criteria for materials.

Course content:

- Lattice structure and lattice defects
- Deformation behaviour
- Diffusion
- Recovery and recrystallization
- Iron-based materials
- Light metals
- Copper and its alloys
Electrical Engineering

Learning objectives / competencies:

By the end of the course students will:

- Understand the principles behind electro technology in the fields of direct current, electrostatics, electromagnetism and alternating current.
- Be familiar with the significant technological applications of basic electrical engineering.
- Have learnt the basics of analog signal processing (amplification, filtering, mathematical processing, modulation).
- Understand the basics of digital technology in terms of information representation and processing and its technical realization (AD/DA transformation, compression).
- Have learnt how to deal with industrial simulation methods.

Course content:

- Direct current: simple electric circuits, network analysis, equivalent voltage sources.
- Electrostatics and electromagnetism: physical principles, capacitance and inductance, Faraday’s law, motors and generators, transformers.
- Alternating current: calculation methodology, applications (modulation, spectral analysis).
- Semiconductor technology and signal processing: transistors, operational amplifiers, filtering.
- Digital technology: digitalization, digital signal processing.
- Internship with industry standard software.
Learning objectives / competencies:

By the end of the course students will:

- Understand the advantages and disadvantages of various joining techniques.
- Know the structural constraints of different joining techniques.
- Be able to identify the basic operation of parts or assemblies from technical drawings and be able to infer the mechanical model from them.
- Be able to calculate and interpret different compounds and machine elements using simple formulas.
- Be familiar with different shaft-hub connectors, their properties and design principles.

Course content:

- Features of detachable connections such as screws, pins, rivets
- Features of non-releasable connections such as welding, soldering, gluing
- Calculation methods for different joining techniques
- Shaft – hub connections
Financial Accounting

Learning objectives / competencies:

By the end of the course students will:

- Understand the basic principles and procedures of accounting.
- Be able to record business transactions for an industrial company.
- Be able to assess how the balance changes according to entrepreneurial activity.
- Know how to record balance sheet assets and liabilities in accordance with German and the international law.
- Be able to calculate the number of the balance sheet items in accordance with German and the international law.
- Be able to compile the profit and loss statement.

Course content:

- Basics of accounting
- Accounting according to German law
- Accounting according to international law
Economics

Learning objectives / competencies:

By the end of the course students will:

- Have acquired the necessary knowledge to understand macroeconomic contexts.
- Understand the link between the political economy and business administration in order to comprehend the economical consequences of corporate activities.
- Appreciate the operational consequences of macroeconomic developments and economic policy decisions.

Course content:

- Performance of the market: how do markets work and why are they effective?
- Pricing in different markets: how to develop optimal business strategies.
- Competition and competition barriers: economy policy methods to ensure competition.
- Growth and employment: theoretical considerations, current trends and economic policies.
- International economics: theory of foreign trade, presentation and analysis of external economic interlacing.
3. Compulsory Modules in the 3rd Semester

Production Technology I

Learning objectives / competencies:

By the end of the course students will:

- Have learnt the basics of the industrial manufacturing of work pieces
- Have understood the main groups of manufacturing engineering.
- Be familiar with the important manufacturing processes of the main groups: forming, transforming, separating, joining and coating.
- Know the typical machines and tools used for various processes.
- Understand the interplay of quality and costs in the relative manufacturing process and which consequences are relevant to each process.
- Be able to perform basic calculations for the most important manufacturing processes.

Course content:

- Distinction production – manufacturing engineering
- Main groups of manufacturing engineering
- Selected manufacturing processes
Production Technology and Plastics in Automotive Industry

Learning objectives / competencies:

By the end of the course students will have gained insight into and often in-depth knowledge of:

- The properties, structures and uses of plastics.
- Processing methods with regard to lot sizes, costs and recoverable characteristics.
- Equipment and tools used for producing plastic parts.

Students will:

- Be familiar with the structure of a plant for car production.
- Understand the structure and functioning of the body construction and assembly technologies.
- Have learnt the basics of pneumatic, hydraulic and electric control systems.
- Understand the interaction between components in highly automated areas.
- Understand the structure and organization of manual work areas.
- Know about logistics processes.

Course content:

- Use of plastics
- Injection moulding
- Extruding
- Calendering
- Plant structure
- Logistics overview
- Introduction to control engineering
- Vehicle body construction
- Assembly
- Order and production control
- Quality assurance
Concepts of Automobiles

Learning objectives / competencies:

By then end of the course students will:

- Have learnt about different vehicle types and concepts as well as current market developments.
- Be familiar with the product development process, from marketing strategies and product decisions to production development and product launch.
- Have gained a comprehensive overview of procedures and processes in the automotive industry.
- Have learnt about the interaction between vehicle packages and the design concepts behind individual vehicle disciplines.

Course content:

- Classification and representation of different vehicle types and concepts.
- Complete vehicle development with regard to economics, ergonomics, marketing and sustainability, with the current issues of downsizing, resources and emissions.
- Package options according to country-specific features, demographic development and cultural differences.
- Power units, landing gears, passive safety, body shell and interiors.
- Insight into the development processes, including construction and quality assurance methods.
Learning objectives / competencies:

By the end of the course students will:

- Understand the basic relationships in project management.
- Be familiar with the essential concepts, approaches and methods used in project development: preparing, planning, procurement, monitoring and controlling.
- Understand the relationship between project management and other functional areas.
- Recognize the influence of cross-cultural management and behavioural factors on project success.
- Be able to analyse typical project situations and know how to act and how to find appropriate solutions.
- Be familiar with the standards and requirements of quality management systems.
- Understand how quality management systems are introduced and implemented in a company according to ISO 9000:2000 and be familiar with industry-specific requirements for quality management systems.
- Know how to choose and apply quality methods in the development process in manufacturing and product application.
- Be able to assess quality in products using sampling systems.
- Understand the statistical process of planning and know how to create and assess quality control charts.
- Be able to prepare and carry out machine and process capability studies and know how to obtain measurements from these values.
- Know where quality-related costs arise and what knowledge the collection of these costs can provide.

Course content:

- Basic relationships in project management
- Objectives and project assignment
- Process models in project management
- Project structure
- Methodology for scheduling and cost planning
- Project controlling
Further course content:

- Project organization and project team leadership
- Development of quality management
- Quality management systems
- Quality jobs within the company
- Quality methods in the life cycle of projects and products
- Quality assurance in production
- Quality costs and indicators
Learning objectives / competencies:
By the end of the course students will:

- Have developed comprehensive language communication skills.
- Expanded their knowledge of technical terminology and be familiar with the most important professional activities.
- Have acquired knowledge and expertise in the field of Business English.

Course content:

- Improving communicative skills in a vocational context.
Cost Accounting

Learning objectives / competencies:
By the end of the course students will:

- Be able to transfer expenditures from bookkeeping into costs.
- Be able to perform internal cost allocations with the correct procedures.
- Have learnt how to calculate the cost of a product with the correct calculation method depending on the type of production.
- Know how profit can change according to specific decisions.
- Recognize the shortcomings of traditional cost accounting and be able to remedy them.

Course content:

- Cost type accounting
- Cost centre accounting
- Cost unit accounting
- Marginal costing
- Activity accounting
- Planned cost calculation
4. Compulsory Modules in the 4th Semester

Production Technology II

Learning objectives / competencies:

By the end of the course students will:

- Be familiar with the applications of important industrial production procedures for the production of parts for metalworking.
- Be familiar with the typical machines and tools used for selected manufacturing processes.
- Know how to assess the effect of manufacturing parameters on quality and costs and thereby be able to recommend adequate manufacturing procedures.
- Have learnt the methods for calculating the most important manufacturing processes.
- Be able to assess the potential for rationalization to improve productivity and flexibility.

Course content:

- Machining
- Forming
- Machining tools
Driving Dynamics

Learning objectives / competencies:
By the end of the course students will:

- Understand the longitudinal, lateral and vertical dynamics of automobiles.
- Understand the transmission mechanism of tyres.
- Know how to calculate driving resistance.
- Be able to assess trade-offs in the drive train.
- Be able to assess influences on driving behaviour.
- Know how to apply standards of assessment to driving behaviour.
- Understand and be able calculate spring and damper designs.

Course content:

- Longitudinal, lateral and vertical dynamics of vehicles
- Modelling
- Characteristics of tyres
- Driving resistance including the aerodynamics of automobiles
- Energy conversion and the drive train
- Driving limits and the theory of differentials
- Deceleration and braking stability
- Lateral dynamics, the single-track model and stability
- Steering, under and over steering, influencing opportunities
- Objective and subjective assessment of driving behaviour
- Assessment and calculation of the vertical vibration behaviour
Electronics and Electrical Drives

Learning objectives / competencies:

By then end of the course students will:

- Be familiar with the functioning of individual components and the applications of semiconductor electronics (diodes, transistors, motors, operational amplifiers).
- Students will gain theoretical and practical knowledge of the operating principle behind drive trains, their force/torque generating mechanism and the trade balance in both working and regenerative mode.
- Students will learn about the calculation, mechanical design, usage characteristics, estimations and correlations between key variables such as forces, torques, speeds, magnetic parameters (saturation induction, critical field strengths).
- Students will study:
  - Mechanical and electrical output
  - Efficiencies, temperatures, cooling solutions
  - Mechanical design characteristics, applicability
  - Function-specific materials and their importance in various engines
  - Manufacturing technologies, the isolation procedures of various engines and price expectations
  - Cost assessment in the context of mechatronics

Course content:

A) Integrating an electric drive in a mechatronic problem and optimal resolution:

- Static drives (torque device, lifting magnets, magnetic holding devices)
- Moved linear drive actuators (linear electric engines, conveyer actuators)
- Moved rotary drive actuators (commonly known as electric engines)

B) These topics relate primarily to the relevant rotating drive actuators:

- Rotary current induction engine on a rigid three-phase power grid
- DC machines in various types of circuits (including inverter-fed)
- Inverter-fed permanent magnet synchronous machine, BLDC
- Inverter-fed three phase induction machines
C) The energy supply for these drives:

- Connection conditions in a fixed grid
- Converters (basic circuits) for the individual drives
- Operating modes of the inverter (multi-quadrant operation, power recovery, regenerative braking)

D) Control of variable speed drives:

- General-regulated cascade structure, sensors and control devices (controllers)
- Control algorithms for the different types of drives, control objectives (speed, position, torque)
- Torque-control with field orientation for BLDC and three-phase asynchronous
- Voltage / frequency control of asynchronous machines
- Full block control for synchronous permanent magnet drives

E) Knowledge of connection conditions, nominal sizes, labels, safety precautions and protective factors at drive installation:

- Loads (load types, load characteristics, load cycles, transmission)
- Modes (continuous, intermitted, environmental conditions)

F) Designing (selection of machines/ drives)

G) The dangers of electric current and moving masses, as well as the necessary safeguards.

H) Electronics:

- Physical principles of semiconductors
- Homogeneous semiconductor components
- Diodes
- Applications of diodes and decade diodes
- Bipolar transistors
- Unipolar transistors (FETs)
- Insulate gate bipolar transistor (IGBT)
- Opto-couplers
- Analog circuits (operational amplifiers)
- Digital circuits
Vehicle Electrical Systems plus practical work

Learning objectives / competencies:

By the end of the course students will:

- Understand the operation of electrical and electronic automotive subsystems.
- Be familiar with the main methods for setting the parameters (application) of vehicle control devices.
- Be familiar with the structures of communication between electronic systems in vehicles.
- Be able to dimension subsystems.
- Know how to interpret and evaluate the measurement results of mechatronic vehicle systems.

Course content:

- Power supplies (generators, batteries), starters, sensors and actuators, CAN and Flex Ray bus, electronic engine management, electronic traction control systems.
- Case study on selected topics regarding automotive electronics (engine management, slip control systems, CAN bus and car sensors; basic experiments to rectifier circuits; transistors; operational amplifiers in terms of car applications).
Combustion Engines

Learning objectives / competencies:

By the end of the course students will:

- Know how to calculate the main variables and main dimensions.
- Be familiar with how internal combustion engines work, their basic forms and their individual components.

Course content:

- Basics of thermodynamics
- Characteristic curves and maps
- Characteristics of the fuels used in internal combustion engines
- Facilities for charge exchange
- Carburetion
- Ignition and combustion in petrol and diesel engines
- Motor control and regulations
- Structure and function of specific engine types
- Emissions
- Hybrid and special procedures
Business Language: English II

Learning objectives / competencies:

By the end of the course students will:

- Have developed comprehensive language communication skills.
- Expanded their knowledge of technical terminology and be familiar with the most important professional activities.
- Have acquired knowledge and expertise in the field of Business English.

Course content:

- Improving communicative skills in a vocational context.
Finance and Investment Management

Learning objectives / competencies:

By the end of the course students will:

- Understand the basics of investing and finance.
- Have learnt about the tools used in financial and investment controlling.
- Be familiar with funding instruments.
- Recognize the influence of investment and finance on business success.
- Be able to show the context of and background to financial decisions with practical examples.

Course content:

- Basics of finance and investment management
- Companies as bundles of cash flows
- Financial mathematic applications
- Analysis of annual reports and corporate figures
- Investment calculation methods
- Instruments to raise capital
- Financial and risk policies
Marketing and Sales: Basics
(Taught in English)

Learning objectives / competencies:
By the end of the course students will:

- Understand the basics of marketing for investment goods and durable consumer goods.
- Be familiar with the requirements of and procedures for the segmentation of markets and positioning of products.
- Recognize the interrelationships in the integrated product lifecycle.
- Understand the impact of technology management and marketing on a company’s success.
- Appreciate the strategic context of and background to marketing decisions in the real market.
- Be able to use the knowledge they have acquired in case studies and project work.

Course content:

- Principles of marketing
- Segmentation and positioning
- Procedure for market research
- Integrated product lifecycle
- Products as a mix of technologies
- The First/follower problem
5. Compulsory Modules in the 5th Semester

Production Technology III and Automation plus practical work

Learning objectives / competencies:
By the end of the course students will:

- Be familiar with the typical machines and tools used in automation.
- Be familiar with industrial robots and other handling equipment and know where they can be used.
- Have learnt about the applications of important industrial automation components.
- Know about possible solutions to the gradual development of automation.
- Be able to assess the potential for improving automation in manufacturing.
- Have learnt how to create simple CNC programs.

Course content:

- CNC control of machine tools
- Industrial robots and flexible handling systems
- Design and control of automated manufacturing systems
- Measurements to increase productivity and flexibility
- Effective potentials for maintenance
- CNC programming
Automotive Engineering plus practical Work

Learning objectives / competencies:

By then end of the course students will:

- Be able to describe, design, calculate and test the major components of motor vehicles.
- Be familiar with the design features, construction and testing of components and the safety standards of road vehicles.
- Understand the requirements for motor vehicles and their body components.
- Understand and know how to plan the development procedure.
- Be able to create requirements specifications.
- Be familiar with the requirements of active and passive safety.
- Know and understand the different axle and steering concepts.
- Be able to evaluate the influence of axle geometries on driving behaviour.

Course content:

- Main components of road vehicles
- The essential key factors in design
- Construction and testing regulations as well as safety standards
- Requirements for motor vehicles and their components
- Requirements specifications and the development sequence
- Design and construction of vehicle bodies
- Active and passive safety
- Design and calculation of the chassis
- The basic types of steering systems and axles
- Wheel position and its influence on driving behaviour
- Vehicle control system
- Driver assistance systems
**Gearbox Systems**

**Learning objectives / competencies:**

By the end of the course students will:

- Understand the function and necessity of automotive transmission in connection with internal combustion engines.
- Be able to select drive trains for vehicles.
- Be familiar with the structural design of different types of gears (manual transmission, fully automatic, dual-clutch gearbox, axle drives, differentials, torque converters, etc.).
- Be familiar with the geometric design of spur gearing and be able to carry out normal strength tests for these gears.
- Know about the manufacturing processes of gears.

**Course content:**

- Types of vehicle transmissions (e.g. gearboxes, planetary gears)
- Translations, gear stages, efficiency
- Driving resistance
- Linking transmission and engine
- Switching elements
- Gear geometry
- Surface durability
- Bending strength
Production Management and Logistics I

Learning objectives / competencies:

By the end of the course students will:

- Understand the basics of technical operational management such as work plans, bills of materials, time plans, etc.
- Understand the importance of how to estimate numbers of demand in order to draft a flexible production plan.
- Be familiar with the types of organization and performance of production.
- Be aware of the different forms of production control.

Course content:

- Methods of time management
- Content and structure of work plans
- Content and structure of bills of materials (BOM)
- Pay systems in production
- The importance of collective agreements
- Establishment of shift schedules
- Organizational and performance types
- Procedure in the layout plan
- Optimization of material flow
- The importance of demand forecasting
- Capacity planning process within the company
- Stock disposition
- Introduction to production management methods (push versus pull)
Business Planning and Organisation

Learning objectives / competencies:

By the end of the course students will:

- Know about the different procedures and methods of strategic and tactical operational planning in the different life stages of a company.
- Understand different design models of an organization (organizational structure, process and projects)
- Be able to select appropriate methods and procedures to solve problems.

Course content:

- Strategic planning and designing of business concepts, long-term objectives, resources (financial and expertise), product-market concept, SWOT analysis, derivation of the performance strategy.
- Organizational strategy to obtain the structure of an organization, including the creation of jobs and hierarchies.
- Capacity dimensioning, derived business and investment plan preparation, the problem of uncertainty in all components of strategic planning and design.
- Implementation of performance and organizational strategies with project management, the interface of strategic planning and budget planning, the problem of adjusting the annual budget during the current year.
- Management of priority conflicts and crisis situations in the current business (lean management, reengineering, rationalization, innovation management).
- Feedback systems using metrics and balanced scorecards.
Market Marketing and Sales: Automobiles

(Taught in English)

Learning objectives / competencies:

By the end of the course students will:

- Be familiar with and understand the basic elements of marketing and sales in the automotive industry.
- Understand the functions of marketing and sales when selling vehicles and in the distribution of purchased parts, components and subsystems of the supply industry.

Course content:

The course covers all the individual sales and marketing tasks in medium and large sized companies in the automotive industry (car manufacturers, system suppliers and module suppliers, service companies). These are:

- Automotive sales
- Advertising
- Market research
- Communication
- Public relations
- Product management
- Customer relationship management
- Pricing policy
- Strategic planning
- Sales management
6. Compulsory Modules in the 6th Semester

**Service Management**

**Learning objectives / competencies:**

By the end of the course students will:

- Understand the importance of service in the automobile industry.
- Be familiar with service and business structures.
- Understand the relationships between interest groups (manufacturer-dealership-customer).
- Be familiar with the technical, economic and legal conditions in service.
- Understand the complete tasks spectrum of a fleet operating company.

**Course content:**

**Customer’s perspective (fleet):**

- Vehicle purchasing (leasing, buying, renting)
- Vehicle operation (maintenance, service management, damage management, supplier management, owner liability)
- Controlling costs in fleets
- Returns, remarketing, logistics

**Manufacturer’s perspective:**

- Legal framework in the key manufacturing markets
- Workshop systems (contract, free)
- Spare parts logistics
- Service processes and standards
Academic Project Work

Learning objectives / competencies:
By the end of the course students will:

- Be able to solve tasks and problems in the industrial environments, such as work organizations and work design, in a scientific way. This includes data collection, analysis, and preparation of solutions, evaluation and implementation, as well as documentation and presentation with the help of professional tools (e.g. project management, simulation).

Course content:

- Use of standard tools for project management, data analysis and simulation
- Project planning and scheduling (temporal, organizational and content-related)
- Research, data collection and analysis
- Documentation and presentation
Industrial Placement

(20 weeks)

Learning objectives / competencies:

By the end of the course students will:

- Have gained work experience at the interface between technology and business management in addition to the theory they have already learnt at university.

Course content:

- Testing and deepening of the theory that students have already learned.
- Students will cope with the harsh conditions of working life at the interface between technology and business management.

Study and exam performance:

- Students have to take an oral exam consisting of a presentation about their experience (5 min) and an interview to find out about the work done at the interface between technology and business administration (5 min).
- Internship report
- Essay of approximately 10 pages on lessons learned
7. Compulsory Modules in the 7th Semester

**Development and Planning Methods**

**Learning objectives / competencies:**

By the end of the course students will:

- Understand the success factors in product development (in automotive production) and their complex underlying needs and contexts.
- Be able to control the main stages of the development process and apply important methods.
- Have an understanding of important key issues in development management e.g. product portfolio and variants management, requirements and product cost management, development cooperation management and be able to devise suitable solutions according to practical boundary conditions.

**Course content:**

- Tasks in management and organizational management
- Overview of process and methods in development and process optimization
- Strategic product planning
- Development planning and control
- Innovation and technology management
- Requirement and cost management
- Version management
- Change and configuration management
- Development cooperation management
Production Management and Logistics II

Learning objectives / competencies:

By the end of the course students will:

- Have deepened their knowledge of short-to-long term capacity planning.
- Understand optimization approaches and methods used in production management.
- Be familiar with methods of (inventory) disposition, scheduling and production control.

Course content:

- Logistical characteristic curves
- Approaches to cost accounting in production planning
- Value stream mapping
- Kaizen
- Approaches to increase the versatility in the production
- Production control procedures (methods, algorithms, advantages and disadvantages, applications)
- Comparison of different algorithms for determining order quantity (EOQ, Wagner-Within)
People and Organisational Development
(Taught in German and English)

Learning objectives / competencies:

During the course students will:

- Learn the essential elements of leadership in businesses, including both leadership from managers to employees and employees to executives.

The course requires active participation because concepts and theories will be explained as realistically possible (e.g. through discussions, team exercises, role plays). It is expected that students prepare by reading additional articles on this topic.

Course content:

- Leadership models
- Implications of personality in the work environment and team interaction
- Motivation and performance optimization of employees
- Teamwork and group dynamics
- Cooperation in business
- Goal setting and performance dialogues (business performance, people performance)
- HR function in companies
- Personnel selection procedures
- (Top) management communication
- Delegation and time management
Bachelor Thesis

(In German or English)

Learning objectives / competencies:

Students must be able to show that they can solve a specific problem in the field of industrial engineering in a systematic, independent and practice-oriented way (see § 10 SPO).

Course content:

Students will have the opportunity to choose a topic and work on it in cooperation with a professor. They can also decide to work on a topic that a professor has proposed. Students usually choose topics in cooperation with companies.

Study and exam performance:

Written elaboration of the topic: students have to submit a bound copy of their written thesis and a CD of their completed work to the secretary office. This copy will remain with the company or at the university – wherever the student got their topic from. Students have to discuss the structure, nature and scope of the written thesis with their supervising professor.
4. Compulsory Elective Modules

Aerodynamic Principles for Automotive Design
(Taught in English)

Learning objectives / competencies:
By the end of the course students will:

- Calculate or simulate a laminar flow field for a simple shape (e.g. blunt body, cone, ball or block) at low speeds.
- Describe and perform a simple experiment (designed by the students in teams), e.g. to be provided
- Write about it!

Course content:
Part 1 – Basics of low-speed fluid dynamics:

- Do some experiments
- Figure out what’s going on
- Describe what’s going on mathematically
- Describe what is happening verbally
- Present your experiment

Part 2 – Automotive Design:

- Be able to discuss the ins-and-outs of a two-stroke or a four-stroke internal combustion engine.
- Heating/cooling units
- Exterior Design with various shapes

Tour of a Car Manufacturer with an engineer as the tour guide – (could be either BMW or Audi)
ERP-Systems

Learning objectives / competencies:
By then end of the course students will:

- Be able to describe ERP systems, how they can be used successfully in companies and how their IT architecture is designed.
- Be able to differentiate between suite and best-of-breed solutions and justify their respective areas of application.
- Be able to critically highlight the problems of introducing ERP systems and explain best practices for ERP implementation.
- Know how to use the mySAP ERP system in materials management and logistic functions.
- Be familiar with the operation and the basic functions of at least one alternative best-of-breed ERP system (alternative to SAP) and be able to evaluate its use in SMEs.
- Be able to specify criteria for the selection of ERP systems.

Course content:

- What is an ERP system? Product approach, functions, benefits, processes at a glance.
- What are the functions of an ERP system and what can it not do currently?
- Technical system architecture of ERP systems – advantages and difficulties in the use of basic technologies.
- ERP logistic functions at a glance – Which logistics processes are supported by ERP systems and how exactly do they work?
- Problems of ERP for SMEs – The benefits and problems with using ERP systems in small and medium enterprises (SMEs).
- Implementation problems of ERP Systems – How can we learn from the implementation of previous ERP systems? What do we need to know and what can we expect?
- The use of ERP logistic functions – logistic functions in mySAP ERP in practice (practical exercises on a PC).
- Analysis of ERP suites versus ERP best-of-breed solutions from the point of view of an SME.
- Establishing and discussing evaluation criteria for selecting suitable ERP systems.
- Practical exercises on the computer system.
Car Damage and Evaluation

Learning objectives / competencies:

By the end of the course students will:

- Know how to evaluate vehicles.
- Be able to identify the impairment of a damaged vehicle.
- Be able to calculate the amount of damage incurred by a vehicle that has been involved in an accident.
- Know how to establish the residual value of a vehicle.

Course content:

Basics of damage calculation:

- Course of action for the vehicle
- Vehicle data gathering
- Damage assessment and evaluation
- Repair methods
- Calculation of damages

Introduction to the basics of car assessment:

- Determining the original price
- Assessment of the state of the vehicle
- Identification and assessment of special equipment
- Evaluation of merchantability
- Impairment models
- Condition assessment
- Residual value determination
- Worthiness of reparation
Entrepreneurship

(Taught in English)

Learning objectives / competencies:

- Develop an understanding for an holistic approach to entrepreneurship
- Acquire theoretical and practical knowledge concerning the phases of the innovation process
- Are able to work with methods and frameworks like creativity methods, business models and marketing instruments
- Know about the necessary steps (e.g. Business Plan, financing) to found a new venture

Course content:

- The entrepreneurial perspective
- From the problem to the opportunity
- From the business idea to the business plan
- From planning to founding a company
- The life cycle and growth of new ventures
Learning objectives / competencies:

By the end of the course students will:

- Have developed comprehensive foreign language communication skills.
- Expanded their knowledge of technical terminology for the most important professional activities.
- Have acquired basic skills in the economic, cultural and social language characteristics of French-speaking countries.

Course content:

Module 1

- Business communication
- Corporate and commercial basics

Module 2

- Globally important economic areas and their social, commercial and cultural characteristics
- Subject-specific terminology

Module 3

- Aspects of business founding
- Writing reports and presentations
- Current specialized topics
Catia 1

Learning objectives / competencies:

By the end of the course students will:

- Be familiar with the CAD system CATIA.
- Be able to design simple design tasks in CATIA.

Course content:

- The CATIA system
- Modelling in CATIA
- Basic functions
- Preparation of design tasks
CATIA 2

Learning objectives / competencies:

By the end of the course students will:

- Be familiar with the CAD system CATIA.
- Be able to design simple design tasks in CATIA.

Course content:

- The CATIA system
- Modelling in CATIA
- Basic functions
- Preparation of design tasks
Mechanics of Car Accidents

Learning objectives / competencies:
By the end of the course students will:
- Be able to record accidents and their consequences.
- Be able to reconstruct accidents.

Course content:
- Accident mechanics
Change Management
(Taught in English)

Learning objectives / competencies:

Students will be introduced to the process steps associated with “change” and their pitfalls through case study work (individually and/or in small groups) together with group discussion. Our aim is for students to be able to understand the mechanisms of human behaviour that accompany change and how these can be optimally managed to make the process smoother.

Course content:

Each lecture series will be accompanied by case study of work which will build on the lectures and provide practical illustrative examples. There will be time for internet research and to discuss outcomes. Students are expected to supplement their “in course” work with additional research and reading, particularly for the assignment.
Business Process Management

Learning objectives / competencies:

By the end of the course students will:

- Be familiar with the basic procedures for conducting business process improvement projects.
- Understand the methods used in business process modelling and optimization and their inclusion in the architecture of integrated information systems.
- Be familiar with the lifecycle of business processes and operational objectives in business process management.
- Have gained practical experience in modelling and optimizing business processes.

Course content:

- Basic approaches in business process modelling
- Lifecycle of business processes
- Perspectives of the architecture of integrated information systems (ARIS)
- Models and methods for business process modelling (e.g. business process modelling notation (BPMN), event-driven process chain (EPC))
- Developing a marketable tool for business process modelling
- Collecting, modelling and optimizing a real business process in the context of a team project.
- The global economic environment
**Sustainable Development Simulation Game**

Learning objectives / competencies:

By the end of the course students will:

- Have deepened their knowledge of the policy areas of the European Union.
- Be familiar with the dimensions of sustainability and sustainable development.
- Understand the complexity of EU policy (including EU policies and institutions).
- Understand the complexity of sustainability.
- Have developed and strengthened their social skills through group work.

Course content:

- Introduction to the issues of sustainability, sustainable development and corporate social responsibility (CSR)
- Introduction to the European Union, guidance awarding and institutions
- Energy policy
- Renewable energy
Management Decision Making Supported by Data Analysis
(Taught in English)

Learning objectives / competencies:

By the end of the course students will:

- Understand the contribution data analysis can make to management decisions.
- Be able to identify decision-relevant data, analyse it from different angles and use this information to support decision making.
- Be able to present data analysis persuasively in English.
- Know how to lead discussion groups competently in English.

Course content:

- Case studies from various corporate functions such as:
  - Cooperate governance
  - Marketing
  - Production
- Extraction and measurement of appropriate parameters from data sets that come from various fields of activities of engineers and business managers.
- Creation of informative charts showing the stylistic demands of disclosure requirements.
- Practising English to guide and orient discussions.
Planning and Realisation of Production Lines

Learning objectives / competencies:

By the end of the course students will:

- Be able to align the operational tasks of industrialization with a company's strategy.
- Understand the procedures for including customers and suppliers in planning and implementation.
- Know how to evaluate manufacturing concepts commercially and technically.
- Be able to identify potential for rationalization to improve productivity and flexibility.

Course content:

- Management of the industrialization process
- Development of manufacturing concepts and process planning
- Implementation of the equipment procurement
Product Ergonomics

Learning objectives / competencies:
Students will learn about the tactile, visual, acoustic and informal interfaces between humans and their environment with regard to their biomechanical, receptor and informational conditions and their dependencies (age, sex, power conversion, etc.).

Course content:

Regularities of the interaction between humans and the environment or humans and machines:

- Informational: tactile, visual, acoustic
- Energy: biomechanical, thermoregulatory product design
- Actuator and control panels
- Hand-held tools
- Displays and input devices, console design
- Software ergonomics and assistance systems
- Seating and reclining systems
- Lighting
- Noise and vibration protection
- Climate and clothing (protective clothing, work clothes and sportswear)
Resource Efficiency and Resource Management

Learning objectives / competencies:

- The aim of the course is for students to gain the necessary knowledge and skills to work independently on scientific problems in resource efficiency and to learn how to present their findings.
- The module provides students with the necessary multidisciplinary skills and practical experience of project operations to work in interdisciplinary project teams.
- Students will:
  - Work intensively on questions of resource efficiency.
  - Learn about the procedures and methods used to manage projects.
  - Be able to analyse, structure and solve problems independently and in small groups.
  - Independently develop their knowledge, abilities and skills for working in an interdisciplinary team.
  - Be able to present what they have learnt in front of others.

Course content:

- Resource efficiency using the example of the university: students have to consider energy, building and plant engineering, equipment, waste disposal, user behaviour, communication and best practice.
- Work on projects with technical and business tasks, including project management:
  - Definition of project objectives and definition of requirements
  - Structuring of project content and preparation of a project plan
  - Setting up working packages and dividing responsibilities among team members
  - Obtaining and evaluating information
  - Preparation, evaluation and selection of solutions
  - Creating documentation and a presentation
Marketing Project

Learning objectives / competencies:

By the end of the course students will:

- Have gained practical experience in marketing issues from a case study in cooperation with a company.
- Be able to apply the knowledge they acquired in the marketing lectures in case studies and projects.

Course content:

- Work on a case study/project that deals with current issues in marketing
- Creating documentation and working papers
- Individual and group presentations for the overall project
**Automotive Product Development Project**

**Learning objectives / competencies:**

By the end of the course students will:

- Have experienced the challenges of an innovative development project in the balancing act between creativity and feasibility.
- Understand the basic relationships in product development.
- Understand the key practices in the product development process.
- Recognize the importance of the basic stages of project work.
- Understand the connections between technical and business success factors in automotive technology.
- Be able to develop a project and create methodologically innovative solutions based on a specific task in the automotive industry.
- Have learnt how to investigate boundary conditions independently, identify measurements and make/justify necessary decisions in a team.

**Course content:**

- Current challenges in automotive product development
- Stages of the project and product development processes
- Application of innovative management methods
- Goal setting and guidance of project and product goals
Negotiating and Moderating

Learning objectives / competencies:

During the course students will learn about:

- Self-presentation
- Application techniques
- Negotiation
- Conflict management

Course content:

- Negotiating objectives
- Basics of communication
- Negotiation styles
- Preparation of negotiations
- Intercultural communication
- Staff and communication
- Effective communication in a team
- Discussions and argumentations
- Conflict management
- Personality tests
- Exercises
Wie viel Grün ist drin?

(sorry no description available at the moment)