

<b>Mechatronic</b>	<b>Contents of the learning fields</b>
<b>1st year of training</b> <b>Learning field 1</b>	<b>Analyze functional relationships in mechatronic systems</b> <b>Time reference 40 hours</b>
<b>Formulating objectives</b> The students apply regulations and rules in the investigation of technical equipment. They work with technical documents and use their statements for the solution. You master Method for analyzing and documenting functional relationships and conducting discussions technical realization possibilities in the team. They work with block diagrams and use these diagrams to recognize the signal flow, the flow of material and the energy flow and the basic mode of action. The possibilities of data processing for the preparation of work results are recognized by them. The students are sensitized to problems of ecology and the economy of these systems. They are aware of the importance of the English language for technical communication.	
<b>Contents</b> <ul style="list-style-type: none"><li>· Requirement profiles of technical systems</li><li>· System parameters</li><li>· Block diagrams</li><li>· Signal, substance and energy flows</li><li>· Meaning of customer-specific requirements for the technical realization</li><li>· Significance and possibilities of data processing</li><li>· Documentation and presentation of work results</li><li>· Ecological and economic aspects</li></ul>	
<b>1st year of training</b> <b>Learning field 2</b>	<b>Manufacture of mechanical subsystems</b> <b>Time reference 80 hours</b>
<b>Formulating objectives</b> The students describe the structure, characteristics and fields of application of the applied Materials and supplies. They plan their economic use and pay attention to the environmental and health relevant aspects. They read design drawings and are able to sketch excerpts from them and incorporate changes. You choose the mechanical working methods required for the production and evaluate the outcome of the manufacturing process. They use typical English technical terms. Occupational health and safety regulations are taken into account in the preparation and execution of work. You can organize the work as a team.	
<b>Contents</b> <ul style="list-style-type: none"><li>· Individual and assembly drawings, parts lists</li><li>· Machine elements, fits and tolerances</li><li>· Assembly plans, fasteners</li></ul>	

- Technological basics of manual and mechanical machining and forming
- Manufacture of mechanical connections by frictional connection, positive connection, material connection
- Plant-specific materials and auxiliary materials
- Assembly tools and auxiliary devices
- Assembly-appropriate storage, safety aspects, occupational safety
- Testing and measuring equipment, measuring errors
- Ecological and economic aspects

### **1st year of training**

#### **Learning field 3**

#### **Install electrical equipment under consideration safety aspects**

**Time reference 100 hours**

#### **Formulating objectives**

The students have in-depth knowledge of the effect of electrical energy in manageable technical processes. They know basic circuits of electrical engineering, they represent these and examine their mode of action. They apply their knowledge for the selection of electrical equipment. They perform calculations and use tables and formulas to solve the tasks.

You know the dangers that result from the use of electrical energy for people and technology, They master the measures for the protection of humans and technical plants and apply the regulations.

The required test and measuring devices are selected and used by them.

You are working on changes to the working documents. They also take information from English work documents.

#### **Contents**

- Electrical quantities, their relationships, display options and calculations
- Components in DC and AC circuits
- Electrical measuring methods
- Selection of cables and wires for energy and information transmission
- Electrical networks
- Dangers due to overload, short circuit and overvoltage, as well as the calculation of the required protection elements
- Handling of tables and formulas
- Electricity effect on the organism, safety rules, accident relief measures
- Measures against dangerous body currents according to current regulations
- Check electrical equipment
- Causes of overvoltages and interference voltages, their effects, countermeasures
- Electromagnetic compatibility

**1st year of training**

**Learning field 4**

**Examine the energy and information flows in electrical, pneumatic and hydraulic assemblies**

**Time reference 60 hours**

**Formulating objectives**

The students master basic control technology. You read schematics, make sketches and make changes. The technical parameters for the operation of electrical, pneumatic and hydraulic assemblies are known. They know methods for generating the required auxiliary energy. They apply basic measuring methods safe and aware of the dangers of handling electrical, pneumatic and hydraulic aware of systems.

You understand English product descriptions and use the English terms. They observe regulations of occupational safety and environmental protection.

**Content**

- Pneumatic and hydraulic variables, their relationships, display options and calculations
- Supply units for electrical engineering, pneumatics and hydraulics
- Basic circuits of the control technology
- Technical documents
- Signals and measured values in control systems
- Danger when handling electrical, pneumatic and hydraulic power modules
- Economic Aspects, Occupational Safety and Environmental Protection, Recycling

**1st year of training**

**Learning field 5**

**Communicate by means of data processing systems**

**Time reference 40 hours**

**Formulating objectives**

The students describe the use of data processing systems and their classification in operational processes as well as the structures of networked systems and the resulting security requirements. They analyze work orders, obtain operational information and can do this by means of prepare and document industry-standard software. You can get help with solutions from English manuals.

**Contents**

- Operating systems
- Networked by data processing
- Data protection and data safety
- Preparation of information using industry software
- Control of operational processes with the help of data processing
- Ergonomic aspects of computer workstations

**2<sup>nd</sup> year of training**

**Learning field 6**

**Planning and Organizing Workflows**

**Time reference 40 hours**

**Formulating objectives**

The students describe the organizational structures and organize the organization Teamwork according to functional, manufacturing and economic criteria. You know the requirements for making the operational readiness of all necessary for the work process technical means and apply quality control procedures. The possibilities of data processing systems to plan the process and to document all necessary control and organizational steps are being used. You pay attention to the aspects of health and safety at work preparation. English terms are used.

**Content**

- Material disposition and costing
- Analysis of work processes
- Rating u. Documentation of results
- Ergonomics and preventive accident protection
- Simple time and cost calculation
- Presentation procedure of work processes

**2<sup>nd</sup> year of training**

**Learning field 7**

**Realization of mechatronic subsystems**

**Time reference 100 hours**

**Formulating objectives**

The students describe the structures of mechatronic subsystems. They explain that effect of sensors and transducers and adjust sensors. You know ways to realize linear and rotational movements by means of electrical, pneumatic and hydraulic components and apply knowledge about controls and regulations on to influence the direction of travel and movement. By means of signal investigations, they check the function of components and eliminate errors. They design basic circuits and describe their mode of operation in English. Simple programming methods are mastered.

**Contents**

- Timing chain and control loop, block diagrams
- Characteristics of controls and regulations
- Effect of sensors and transducers
- Signal behavior of sensors and transducers
- Programming simple motion sequences and control functions
- Design of circuits
- Graphic representations of control and regulation processes
- Measuring signals
- Basic circuits and mode of operation of drives
- Representation of drive units in function diagrams

**Formulating objectives**

The students describe the structure and the signal course of one of several components existing mechatronic system. They analyze the influence of changing operating conditions on the process flow. They detect errors due to signal examinations at interfaces and eliminate the causes of errors. They use methods for metrological detection of control and regulation processes, prepare the Record and document results. They apply knowledge of the control technology to speed or speed of to influence movements.

They are capable of connecting drive units, select coupling variants between drive units and work machines and use them purposefully. You are aware of the causes and effects of congestion situations. They determine the technical parameters of required protective devices and select them. Circuit changes are incorporated into the technical documentation.

Dangers are known to them. Occupational health and safety regulations are taken by them respected. You can control and control-related relationships and the operation of selected Describe drive units in English. Programming methods are mastered.

**Content**

- Operating characteristics and characteristic curves of drives
- Limit values
- Functioning, selection and adjustment of protective devices
- Control and regulation of drives
- Positioning processes, degrees of freedom
- Testing and measuring method for position determination
- Gearboxes, couplings
- Incorporation of changes into existing documents
- Programming of motion sequences and control functions
- Computer simulation
- Measured value acquisition at interfaces

**3<sup>rd</sup> year of training**

**Learning field 9**

**Examine the flow of information in complex mechatronic systems**

**Time reference 80 hours**

**Formulating objectives**

The pupils can read schematics and, by means of them, the information structure in systems describe. They make connections between electrical, mechanical, pneumatic and hydraulic components They are proficient in the metrological techniques for the investigation of information flows and are able to analyze signals and draw conclusions about possible sources of error. diagnostic procedures using the data processing are used by them.

You are working on changes to existing documents. They also modify documents in English.

**Contents**

- Signal curves in systems
- Signal structures
- Bus systems
- Testing and measuring procedures
- Examination of interfaces between system components
- Networking between subsystems
- Hierarchies in networked systems
- Documentation of measurement results

**3<sup>rd</sup> year of training**

**Learning field 10**

**Planning assembly and disassembly**

**Time reference 40 hours**

**Formulating objectives**

The students master the planning and preparation of assembly and disassembly of mechatronic systems. They explain the process of the work processes and can judge work results. They include aspects of health and safety at work in the preparatory phase on.

They check installation conditions at the site and take them into account. They plan to use the necessary aids. They organize the work in a team. They communicate in English about assembly instructions.

**Contents**

- Operational assembly documents
- Conditions for working at the installation site, taking into account the regulations
- Supply and disposal facilities of mechatronic systems
- Means of transport, hoists and assembly aids
- Safety measures and their testing
- Inspections during assembly
- Tolerances of shape and position
- Adjustments
- Disposal and recycling during disassembly

**Formulating objectives**

The students represent the overall function and sub-functions of a system including of its protective equipment. For this purpose, they take information from technical documentation. They explain the influence of components on the overall system and check with the help of interface investigations their function. The required measuring methods are controlled by them and purposefully applied.

The students explain the procedures for commissioning mechatronic systems and specify the procedure for commissioning an entire system. They use the possibilities of diagnostic systems and interpret function and error logs.

The effectiveness of protective measures is checked by them. They adjust sensors and actuators, check system parameters and set them. Results are in documents documented. They systematically limit errors and eliminate faults. You can communicate in English.

**Contents**

- Block diagrams, effect and function diagrams of mechatronic systems
- Check and adjustment of sensors and actuators
- System parameters
- BUS parameterization
- Software installation
- Troubleshooting procedures in electrical, pneumatic and hydraulic systems
- Fault analysis
- Troubleshooting strategy, typical error causes
- Electrical and mechanical protective measures, protective regulations
- Electromagnetic compatibility
- Process visualization, diagnostic systems, remote diagnostics
- Commissioning protocol, error documentation, repair protocol
- Quality assurance procedures
- Bug fixes
- Consideration of customer requirements
- Influences of mechatronic systems on economic, ecological and social conditions

**4<sup>th</sup> year of training****Learning field 12****Preventive maintenance****Time reference 80 hours****Formulating objectives**

The students describe influences on the operational safety of technical systems and the need for preventive maintenance. They use maintenance schedules and apply detection procedures maintenance requirements. You can check, adjust and adjust safety devices. Health and safety regulations are taken into consideration. You create error analyzes and statistically prepare the results. Results of maintenance work are incorporated into the documentation. The results are also prepared in English.

**Contents**

- Pollution, fatigue, consumption, wear and their effects
- System reliability
- Creation and adjustment of maintenance plans
- Inspections
- Procedure for checking safety devices
- Adaptation of system components to changing requirements
- Diagnostic procedures and maintenance systems
- Quality management
- Documentation
- Incorporation of changes in technical documentation

**4<sup>th</sup> year of training****Learning field 13****Transfer of mechatronic systems to customers****Time reference 60 hours****Formulating objectives**

The students prepare information about mechatronic systems textually and graphically and present them. They plan to instruct operating and operating personnel in the system and carry them out. They exchange information in English. They take into account the principles of customer relations design and the marketing strategies of their clients operation.

**Contents**

- Use of internal communication systems
- Teamwork
- Communication
- Moderation, presentation
- Customer / supplier relationship
- Operating instructions, operating instructions