

German curricula motor vehicle mechatronics

	Timing — Learning situations	Content
<p>Module 1</p> <p>Service and inspect vehicles and systems according to specifications</p> <p>80 hours</p>	<p>Description of the distinction between systems, subsystems, functional units and their interrelationships</p> <p>Operating and auxiliary materials</p> <p>Identification of modules and components which present special hazards</p> <p>Information acquisition, documentation, evaluation of error memories, maintenance data, technical documents and service instructions</p> <p>Knowledge about operational processes; a substantiated selection of tools for service work</p>	<ul style="list-style-type: none"> • Block diagrams • Flow diagrams • Maintenance instructions • Sourcing • Standards, rules, regulations • Brake fluid • Disposal, recycling • High voltage systems • Pyrotechnic systems • Hazardous/explosive/high pressure fluids (e.g. coolants) <p>Use of selected data processing devices</p> <ul style="list-style-type: none"> • Diagnosis • Test devices • Internet • Standard tool set <p>Special tools</p>
		<ul style="list-style-type: none"> •

	Timing — Learning situations	Content
<p>Module 2</p> <p>Test, dismantle, exchange and assemble simple modules and systems</p> <p>100 hours</p>	<p>Information retrieval with the help of technical documents</p> <p>Type and scope of necessary replacement repairs</p> <p>Creation of work plans; selection of tools and operating materials; analysis of spare parts for suitability</p> <p>Analysis of screw connections and other force-fit, form-fit and material-locking connections</p> <p>Determination of appropriate reuse, modification or replacement</p> <p>Analysis of the consequences for the environment in case of improper use</p>	<ul style="list-style-type: none"> • Installation instructions • Repair instructions • Replacement part catalogues • Online information systems • Vocational regulations • Brake mechanism • Exhaust system • Wheels and tyres • Manufacturer keys • Coding of replacement parts • Mechanics • Model types • Usage and assembly • Screw locks • Standards • Key parameters • Corrosion protection • Clamp connections • Rivet connections • Welded connections • Solder connections • Disposal • Recycling • Exchange parts • Quality specifications • Wages and costs of spare parts

	Timing — Learning situations	Content
		<ul style="list-style-type: none"> • UVV (Accident prevention regulations) • Health hazards • Ecological consequences

	Timing — Learning situations	Content
<p>Module 3</p> <p>Identifying and eliminating functional problems</p> <p>100 hours</p>	<p>Diagnosis of faults in electrical, electronic, hydraulic and pneumatic systems</p> <p>Determination of the function and mode of operation of vehicle specific control and regulation systems</p> <p>Use of manufacturer documents</p> <p>Circuit analysis of vehicle subsystems</p> <p>Work with / on high voltage components</p>	<ul style="list-style-type: none"> • Reading of vehicle control unit error memories • Performance of visual inspections • Use of workshop information systems • Online information systems • Vehicle electrical systems • Lighting systems • Circuit diagrams / switching symbols • Connection and terminal designation • Troubleshooting guidelines • Safety • Line technology • Electrical and electronic basic circuits • Hydraulic and pneumatic switches • Activation, securing to prevent against being switched on again, ensuring

	Timing — Learning situations	Content
	Determination of physical sizes and use of suitable testing and measuring devices	<p>that no voltage is present whilst observing the manufacturer's instructions.</p> <ul style="list-style-type: none"> • Use of multimeters, current meters, pressure gauges, flow meters

	Timing — Learning situations	Content
<p>Module 4</p> <p>Implementation of retrofitting work according to customer requirements</p> <p>40 hours</p>	<p>Determination of technical specifications and installation regulations for conversions and retrofits and for the installation of accessories</p> <p>Planning for the implementation of the order and the creation of work contracts</p> <p>Vehicle transfer to the customers</p>	<p>Consideration of</p> <ul style="list-style-type: none"> • Technical possibilities (additional features, functional integration) • Appropriate economic efficiency and legal obligations (registration certificate, road traffic licensing regulations) • Determination of technical requirements for assembly (mechanical, electrical) • Application of industry and standard software • Compilation of all necessary documents and components (instructions for use, general operating permit, entries, replaced components, invoice)

	Timing — Learning situations	Content
<p>Module 5</p> <p>Implementation of inspections and additional work</p> <p>60 hours</p>	<p>Providing an overview of the operating principles and functional relationships of the individual subsystems</p> <p>Identification of necessary inspection and maintenance work</p> <p>Planning of inspection and maintenance work</p>	<ul style="list-style-type: none"> • Engine mechanics • Engine control • Cooling and lubricating systems <p>With assistance</p> <ul style="list-style-type: none"> • Vehicle data and documents • Diagnostic devices • Integrated vehicle diagnostic systems • Workshop information • Web portals <p>Determination of the work sequence</p> <ul style="list-style-type: none"> • Substantiated selection of tools, devices, testing and measuring devices • Causes of wear on vehicle systems and components (scientific principles)

	Timing — Learning situations	Content
<p>Module 6</p> <p>Diagnosis and rectification of malfunctions in on-board power systems, charging current</p>	<p>Comprehension of customer complaints and creation of error hypotheses based on subsystem error memory entries</p> <p>Use of manufacturer-specific security and testing routines</p>	<ul style="list-style-type: none"> • Installation instructions • Repair instructions • Replacement part catalogues • Online information systems • Vocational regulations <ul style="list-style-type: none"> • Activation of high-voltage vehicles

	Timing — Learning situations	Content
systems and starting systems 80 hours	<p>Analysis of the function and interaction of components and modules, considering the information exchange of the control devices involved</p> <p>Evaluation of signal images</p> <p>Selection of replacement parts</p>	<ul style="list-style-type: none"> • Further development of own test routines • Application of circuit diagrams and function charts • Impact of possible errors on the overall system (battery management, start-stop system, pyrotechnic safety switches) • Operational planning of suitable measuring devices (multimeters, diagnostic tests) • Laws of voltage generation (induction) • Rectification (one-way, multi-way rectification) • Electric motor principles • Electrical energy storage • Starter, battery and generator parameters

	Timing — Learning situations	Content
Module 7 Reparation of modules and systems exposed to wear	<p>Information retrieval with the help of technical documents</p> <p>8 hours</p>	<ul style="list-style-type: none"> • Installation instructions • Repair instructions • Replacement part catalogues • Online information systems • Vocational regulations • Brake mechanism

	Timing — Learning situations	Content
and tear 60 hours	<p>Type and scope of necessary replacement repairs 18 hours</p> <p>Creating work plans; selection of tools and operating materials; analysis of spare parts for suitability 16 hours</p> <p>Analysis of screw connections and other force-fit, form-fit and material-locking connections 6 hours</p> <p>Choosing between appropriate reuse, modification or replacement 10 hours</p> <p>Analysis of the consequences for the environment in case of improper use</p>	<ul style="list-style-type: none"> • Exhaust system • Wheels and tyres • Manufacturer keys • Replacement part coding • Mechanics • Model types • Usage and assembly • Screw locks • Standards • Key parameters • Corrosion protection • Clamp connections • Rivet joints • Welded connections • Solder connections • Disposal • Recycling • Exchange parts • Quality specifications • Wages and spare parts costs • UVV (Accident prevention regulations) <ul style="list-style-type: none"> • Health hazards • Ecological consequences

	Timing — Learning situations	Content
Module 8	Malfunctions based on error descriptions, by evaluating the	<ul style="list-style-type: none"> • Actuator analysis • Repair instructions

	Timing — Learning situations	Content
<p>Diagnosis of mechatronic drive management systems</p> <p>80 hours</p>	<p>vehicle's own diagnosis 16 hours</p> <p>Functions and functional relationships of individual drive subsystems 14 hours</p> <p>Selection of suitable measuring and testing methods 10 hours</p> <p>Recognition of correlations and dependencies of relevant control and regulation systems 14 hours</p> <p>Determination of the status of the systems to be tested using diagnostic systems 15hours</p> <p>Comparison with database systems and evaluation of results 11 hours</p>	<ul style="list-style-type: none"> • Error diagnosis • Online information systems • Repair possibilities • Torque controlled engine management systems for gasoline and diesel engines • Hybrid systems • Electric drive units • Transmission clutches • Computer-integrated sensors and actuators (analog, digital) • Ignition • Carburetion • Supercharging • Exhaust system • Exhaust purification system • Control of drive subsystems and electric machines • Error memory entries and environmental conditions, • Actual values of actuators and sensors, • Signal characteristics and characteristic values in ECUs,

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		<p>exhaust gas values, System reactions</p> <ul style="list-style-type: none"> • Determination and documentation of a systematic procedure and sequence of test steps, checking of sensors and actuators of the drive and motor management according to manufacturer specifications, evaluation of signal images from

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<p>Module 9</p> <p>Completion of service tasks on comfort and safety systems</p> <p>80 hours</p>	<p>Identification of necessary inspection and maintenance work on comfort and safety systems via focused dialogue with customers and the use of workshop information / diagnostic systems.</p> <p style="text-align: right;">8 hours</p> <p>Analysis of the vehicle condition to determine the necessity of any additional work</p> <p style="text-align: right;">6 hours</p> <p>Distinguish between measuring and testing methods on hydraulic, pneumatic and pyrotechnic systems and determine the relevant safety regulations</p> <p style="text-align: right;">14 hours</p>	<ul style="list-style-type: none"> • air conditioning, • comfort systems, active and passive safety systems, • Lubricant systems <ul style="list-style-type: none"> • Leak testing and detection for filters and seals <ul style="list-style-type: none"> • Coolants • Pressures, • Pyrotechnics, • Explosives law, • Regulations, • Disposal and recycling

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	<p>Planning of inspection, maintenance and conversion work with the aim of preserving the functionality, safety and value of the vehicle 20 hours</p> <p>Systematise the exchange of wear parts and liquids with an emphasis on an economical and customer-friendly approach 7 hours</p> <p>Manufacturer-specific operation and target-oriented use of integral vehicle diagnostic systems 5 hours</p> <p>Testing of hydraulic, pneumatic, electrical and data networked lines, connections and mechanical connections 20 hours</p>	<ul style="list-style-type: none"> • A substantiated selection of tools, devices and measuring devices for service works, • Description of their use • Compliance with safety regulations when handling hazardous materials. • Determination of the material requirements for operating materials, auxiliary materials and spare parts • Planning of testing and adjustment work using manufacturer documents and data sheets • Parts exchange • Parts repair, • System replacement • A/C service units • Error memory • Documentation of work processes and measurement results • Completion of customer and vehicle-specific service documents Evaluation of works with regard to the • Improvement of operational and customer-oriented procedures • Recognition of conflicting goals between technical

	Timing — Learning situations	Content
		<p>requirements, normative specifications and customer requirements</p> <ul style="list-style-type: none"> • Systematise the work routines for handling the diagnostic systems and devices with an emphasis on efficient and safe use as well as compliance with safety regulations

	Timing — Learning situations	Content
<p>Module 10</p> <p>Reparation of damages to chassis and braking systems</p> <p>80 hours</p>	<p>Analysis of existing chassis and braking systems and their interaction with other vehicle components 20 hours</p> <p>Evaluation of damage analysis results from the self-diagnosis of electronic chassis and brake energy regulation systems 24 hours</p> <p>Determination of repair requirements with the aid of repair instructions, inspection and maintenance instructions 15 hours</p> <p>Determination and measurement of physical driving parameters, setting of required values</p>	<ul style="list-style-type: none"> • Steering • Mountings • Suspension • Damping <ul style="list-style-type: none"> • Anti-lock braking system, • Traction control system, • Electronic stability program, • Brake assistant <ul style="list-style-type: none"> • Team communication with regard to repair methods in accordance with legal requirements • Determination of measures to avoid consequential damages <p>Reaching of decisions on reuse in line with current value based on manufacturer specifications and customer requirements</p>

	Timing — Learning situations	Content
	20 hours	<ul style="list-style-type: none"> • Brake test stand • Wheel alignment work station • manufacturer specifications, evaluation of signal images from the use of tables and formulas • Review of the repair process with regard to quality and cost-effectiveness and the formulation of possible strategies for its improvement

	Timing — Learning situations	Content
<p>Module 11</p> <p>Module 11</p> <p>Diagnose and repair networked drive, comfort and safety systems</p> <p>80 hours</p>	<p>Identification of vehicle equipment with the aid of electronic information systems 12 hours</p> <p>Interpretation of the results of the self-diagnosis and familiarise themselves with the operating principles of networked vehicle systems with the aid of technical information systems 8 hours</p> <p>Analysis of data exchange and system interfaces as well as their associated mutual dependencies and functions 24 hours</p>	<ul style="list-style-type: none"> • Comfort systems, • Comfort Systems • Safety and driver assistance systems, • Drive train • Manufacturer-specific network instructions and topology-guided and user-based diagnostics • BUS systems, • Voltage levels, • Clocking, • Line technology • Measured value blocks,

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	<p>Selection of system-related testing devices and the limitation of errors with the aid of integral vehicle diagnostics 12 hours</p> <p>Checking of sensors and actuators that are part of the network 24 hours</p>	<ul style="list-style-type: none"> • Actuator diagnosis, • Adaptation values • Students evaluate, and document measured values and signals as well as ECU parameters and generate error logs.
		<ul style="list-style-type: none"> • They can control the functions of the repaired systems and consider the work that has been carried out from a work economic point of view.

<p>Module 12</p> <p>Preparation of vehicles for safety tests and approvals 40 hours</p>	<p>Analysis of the legal requirements and application of the rules, norms and regulations to perform these services.</p> <p>Identification of vehicles with manufacturer-specific information systems and detection of system data with diagnostic devices 10 hours</p> <p>Preparation of prescribed test and inspection conditions for the tests and approvals, Review of the functionality of</p>	<ul style="list-style-type: none"> • Investigation of vehicle relevant conditions • Preparation and documentation of checklists • Implementation of target value comparisons • Main inspection, • Exhaust inspection, • Additional inspections, • Approvals, • Authorisation
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	<p>vehicle subsystems, Logging of testing and assessment procedures 15 hours</p> <p>Planning of necessary repair and modification work and the determination of expected costs. Informing the customer about the condition of the vehicle, service intervals, any defects and the subsequent necessary repairs 15 hours</p>	<ul style="list-style-type: none"> • Type, • Scope, • Costs
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<p>Module 13</p> <p>Reparation of drive components</p>	<p>Identification of workshop information systems and determination of drive components in need of repair 25 hours</p> <p>Evaluation of customer complaints in order to limit the causes of errors 15 hours</p> <p>Analysis of the functions and interactions of modules and the assessment of the influence of possible errors on the functionality of the entire system 16 hours</p>	<ul style="list-style-type: none"> • Engine mechanics, • Coupling, • Manual, torque converter and distribution gearboxes, • Axle drives • Oil loss, • Power deficiency, • Gear changes • Sounds • Movement changes, • Power and torque transmission, • Gear transmission ratios, • Changing of the rotational direction, • Rotation and torque compensation
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	<p>Interpretation of electronically controlled system self-diagnosis results and planning of the repair with the aid of digital information technology. In order to better understand the subsystems, students perform technical calculations via.. 12 hours</p> <p>..the selection of suitable special tools and machines and application of occupational safety and environmental protection regulations. 12 hours</p>	<ul style="list-style-type: none"> • Thermal expansion, • Force diagrams, • Torque curves, • Transmission ratios, • Clutch slippage • Comparison of repair costs • Evaluation of replacement costs • Informing the customer of the advantages and disadvantages of various repair solutions • Consultation with regard to the repairs to be carried out • Implementation of test routines before vehicle handover
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<p>Module 13</p> <p>Equipping, modification and retrofitting of systems and components 60 hours</p>	<p>Equipping, modification and retrofitting in accordance with technical requirements and possibilities 14 hours</p> <p>Observance of legal regulations and economic aspects; determination of the respective technical requirements for the conversion and installation of any additional equipment 8 hours</p>	<ul style="list-style-type: none"> • Gas powered systems, • Wireless signal transmission, • Antenna systems, • Entertainment electronics), mechanical, electrical features • Compliance with technical documents and industry-standard information systems • Observance of safety regulations (technical, traffic-related and
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	<p>Checking of the availability of the required parts and the comparison of alternative offers with regard to qualitative and quantitative aspects 8 hours</p> <p>Implementation of the planned assembly and connection work and incorporation of systems into the vehicle assembly 12 hours</p> <p>Preparation of the documentation for the replacement parts necessary for the work carried out as part of the vehicle handover and verification of completeness 18 hours</p>	<p>operating safety guidelines as well as ergonomic requirements)</p> <ul style="list-style-type: none"> • Labour costs, • Parts costs <ul style="list-style-type: none"> • Integration, familiarisation, activation, coding • Selection of suitable tools, devices and measuring devices for the conversion and retrofitting work • Observance of the relevant specifications, rules and regulations (technical, traffic and safety standards for the protection of persons) <ul style="list-style-type: none"> • Documentation of work procedures and completion of vehicle specific documents (general operating permit, approvals, entries) • Implementation of the handover, briefing and familiarisation of the customer with the handling
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		<ul style="list-style-type: none"> • Development of customer-oriented consultancy forms • Evaluation of student's work with regard to the improvement of operational and customer-oriented approaches and communication • Identification of conflicting interests between technical requirements, normative specifications and customer wishes and contribute to their solution during
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. The development of the practical vocational training structure

The theoretical content of the lessons is supported by practical content. Practical training courses should take place according to progress made with the theoretical content.

		Teaching Year 1		Teaching Year 2		Teaching Year 3	
Vocational Theoretical Classes		1	2	3	4	5	6
1	Service and inspect vehicles and systems according to specifications	40	40				
2	Test, dismantle, exchange and assemble simple modules and systems	50	50				

3	Identifying and eliminating functional problems	50	50				
4	Implementation of retrofitting work according to customer requirements	20	20				
5	Implementation of inspections and additional work			30	30		
6	Diagnosis and rectification of malfunctions in on-board power systems, charging current systems and starting systems			40	40		
7	Repairing modules and systems exposed to wear and tear			30	30		
8	Diagnosis of mechatronic drive management systems			40	40		
9	Completion of service tasks on comfort and safety					40	40
10	Reparation of damages to chassis and braking systems					40	40
Specialisation							
11	Diagnosis and repair of networked drive, comfort and safety systems					40	40
12	Preparation of vehicles for safety tests and approvals					20	20
13	Reparation of drive components					40	40

14	Equipping, modification and retrofitting of systems and components					30	30
Vocational practical classes — Basic level							
G-K1/15	Repair technology 1 - Vehicle electrical systems	40					
G-K2/15	Repair technology 2 - Vehicle mechatronics	40					
G-K3/15	Repair technology 3 - Service and maintenance of vehicles		40				
G-K4/15	Repair technology 4 - Vehicle repair and maintenance		40				
Vocational practical classes — Specialist level							
K1/15	Diagnostic technology 1 - Electrical vehicle systems			40			
K2/15	Diagnostic technology 2 - Motor management			40			
K3/15	Diagnostic technology 3 - Chassis/brakes				40		
K4/15	Diagnostic technology 4 - High voltage technology				40		
K5/15	Diagnostic technology 5 - Vehicle data transmission					40	
Total-teaching units of theoretical and practical vocational training classes							

The contents of the practical training classes are presented below. Here the basic level courses Repair technology 1 – 4 are carried out according to the student's learning

progress with the theoretical contents of the vocational training. After the transition to the 2nd training year, the specialist level courses Diagnostic Technology 1 to 6 shall follow.

Training topic Repair technology 1 — Vehicle electrical systems

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Section	Contents	Time allocation
1.1 Commissioning and decommissioning vehicle technical systems	Application of manufacturerspecific specifications, safety regulations and protective measures, in particular, standards and regulations for electrical works on motor vehicles and highvoltage vehicles, as well as compliance with accident prevention regulations and technical rules	10 %
1.2 Measurement and testing of systems	<ul style="list-style-type: none"> • Obtaining target data, selection of suitable measuring methods and instruments • Recording and evaluating measured values with target data, in particular measuring, testing and evaluating electrical quantities and signals on components, modules and systems. • Visual inspection of electrical connections, lines and line connections for mechanical damage. • Checking functionality of electronic components, cables and fuses • Documentation of test results 	40 %
1.3. Implementation of service and maintenance work	<ul style="list-style-type: none"> • Circuit diagrams and function charts and inspection of electrical lines, connections and mechanical connections • in vehicles 	10 %

Section	Contents	Time allocation
	<ul style="list-style-type: none"> • Documentation of work steps as well as test and measurement results 	
1.4 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Understanding customer complaints • Identification of damage and malfunctions to electrical and electronic systems of vehicles and their components • Determination of errors and their causes with the aid of circuit diagrams and function charts • Creation of test protocols and documentation of results 	15 %
1.5 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Dismantling and disassembly of components • Assembly of components and functionality testing • Inspection, repair and documentation of electrical connections and terminals 	25%
	<ul style="list-style-type: none"> • 	

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.
- Operational, technical and customer-oriented communication and presentation of facts
 - Identification of vehicles, systems, components and modules
 - The reading and use of drawings / diagrams

- Planning and controlling of work processes, monitoring and assessment of work results
 - Planning and determination of work steps and procedures.
 - Preparation of the work place taking the assigned work into account
 - Monitor evaluate and document work results using target/actual value comparisons
 - Compliance with the manufacturer's safety instructions
- Quality management
 - Implementation of testing equipment according to requirements
- Maintenance and servicing of operating materials
 - Cleaning and maintenance of operating resources

Training topic Repair technology 2 — Vehicle mechatronics

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Operation of vehicles and systems	<ul style="list-style-type: none"> • Observation and implementation of safety and operations regulations and guidelines • Application and explanation of operating instructions • Handling of vehicle and system controls 	5 %
1.2 Decommissioning and commissioning	<ul style="list-style-type: none"> • Implementation of manufacturer-specific specifications, accident prevention regulations and technical rules • Verification of functionality and documentation of results 	5 %

Differentiation	Contents	Time allocation
of vehicle technical systems		
1.3 Measurement and testing of systems	<ul style="list-style-type: none"> • Identification of target data, selection of measuring methods and instruments • Recording and evaluation of measured values with target data • Measurement and testing of physical parameters, particularly pressures and temperatures • Documentation of test results 	35 %
1.4 Implementation of service and maintenance work	<ul style="list-style-type: none"> • Implementation of work and safety rules • Inspection of mechanical modules and systems for wear, damage, impermeability, positional deviations and functionality • Implementation of circuit diagrams and function charts Inspection of hydraulic, pneumatic and electrical lines, connections and mechanical connections • Performance of functionality checks and documentation of work steps as well as testing and measurement results 	15 %
1.5 Diagnosis of errors and faults in vehicles and systems	<ul style="list-style-type: none"> • Understanding customer complaints, performance of functionality checks • Identification of damage and malfunctions to mechanical, mechatronic and pneumatic systems of vehicles and their components • Identification or errors and their causes with the aid of functional plans • Creation of test protocols and documentation of results 	15 %
1.6 Disassembly, repair and assembly of components,	<ul style="list-style-type: none"> • Decommissioning, disassembly, recyclability, labelling and systematic storage of components, modules and systems 	25%

Differentiation	Contents	Time allocation
modules and systems	<ul style="list-style-type: none"> • Assembly of components, modules and systems, commissioning and inspection of functionality and dimensional accuracy 	

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.
- Operational, technical and customer-oriented communication
 - Presentation of facts
 - Identification of vehicles, systems, components and modules
 - The reading and use of drawings / diagrams
- Planning and controlling of work processes, monitoring and assessment of work results
 - Planning and determination of work steps and procedures
 - Preparation of the work place taking the assigned work into account
 - Monitor evaluate and document work results using target/actual value comparisons
 - Compliance with the manufacturer's safety instructions
- Quality management
 - Implementation of testing equipment according to requirements
- Maintenance and servicing of operating materials

- Cleaning and maintenance of operating resources

Training topic Repair technology 3 - Service and maintenance of vehicles

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders

Differentiation	Contents	Time allocation
1.1 Operation of vehicles and systems	<ul style="list-style-type: none"> • Menu navigation and use of information, communications, comfort and safety systems 	5 %
1.2 Decommissioning and commissioning of vehicle technical systems	<ul style="list-style-type: none"> • Application of manufacturer specific guidelines • Verification of functionality and documentation of results 	5 %
1.3 Measurement and testing of systems	<ul style="list-style-type: none"> • Electrical connections, Inspection of lines and line connections for mechanical damage • Documentation of test results 	20 %
1.4 Implementation of service and maintenance work	<ul style="list-style-type: none"> • Application of work and safety rules and regulations as well as manufacturer guidelines during transport and lifting • Moving, parking, lifting, supporting and securing vehicles, modules and systems • The performance of maintenance work according to specifications, in particular, the monitoring of operating fluids, as well as their refilling and replacement including their proper disposal • Inspection of mechanical modules and systems for wear, damage, impermeability, positional deviations and functionality 	

Differentiation	Contents	Time allocation
	<ul style="list-style-type: none"> • Use of maintenance and testing instructions and the performance of maintenance work • Implementation of functionality checks and the reading of error memories • The documentation of work steps as well as testing and measurement results 	
1.5 Diagnosis of errors and faults in vehicles and systems	<ul style="list-style-type: none"> • Understanding customer complaints, implementation of functionality checks • Creation of test protocols and documentation of results • Identification of data communication between ECUs 	15 %
1.6 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Inspection of electrical connections and terminals 	15 %

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.
- Operational, technical and customer-oriented communication
 - Presentation of facts
 - Communication with customers and safeguarding of previous and subsequent functional areas

- Reading and implementation of repair, assembly, commissioning and operating instructions, catalogues, tables and diagrams
- Planning and controlling of work processes, monitoring and assessment of work results
 - Planning and determination of work steps and procedures
 - Preparation of the work place taking the assigned work into account
 - Monitoring, evaluation and documentation of work results using target/actual value comparisons
 - Observation of manufacturer safety instructions, particularly for vehicles with alternative drive systems
- Quality management
 - The systematic identification of errors and quality deficiencies, their elimination and the documentation of the work involved
- Maintenance and servicing of operating materials
 - Cleaning and maintenance of operating resources

Training topic Repair technology 4 - Vehicle repair and maintenance

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Decommissioning and commissioning	<ul style="list-style-type: none"> • Implementation of manufacturer-specific guidelines and accident prevention regulations • Verification of functionality and documentation of results 	5 %

Differentiation	Contents	Time allocation
of vehicle technical systems		
1.2 Measurement and testing of systems	<ul style="list-style-type: none"> • Obtaining target data, selection of suitable measuring methods • Suitable selection of measuring tools for measuring and checking lengths, angles and surfaces • Measurement of lengths, in particular with callipers, gauges and dial gauges, verification of compliance with tolerances and fits • Verification of work pieces with angles, limit gauges and thread gauges • Documentation of test results 	25%
1.3 Implementation of service and maintenance work	<ul style="list-style-type: none"> • Inspection of mechanical modules and systems for wear, Inspection for damages, leak tightness, positional variations and functionality 	5 %
1.4 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Understanding customer complaints, implementation of functionality checks and definition of diagnostic paths • Determination of damage and malfunctions to mechanical components • Creation of test protocols and documentation of results 	20 %
1.5 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Decommissioning of components, modules and systems, dismantling, disassembly and identification of substances hazardous to safety and health, determination of reusability, labelling and systematic storage. • Allocation of disassembled components and modules systems and verification of completeness Cleaning, sanitisation, 	45 %

Differentiation	Contents	Time allocation
	<p>preservation and storage of components and modules</p> <ul style="list-style-type: none"> • Assembly of components, modules and systems, especially screw connections whilst considering the parts sequence and the torque • Assembly of components, modules and systems, commissioning and inspection of functionality and dimensional accuracy • Marking and centring of reference lines, hole centres and outlines considering the material properties, drilling and installation of work pieces, producing and repairing internal and external threads • Repairation of components and systems subject to wear, in particular, brakes 	

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.
- Operational, technical and customer-oriented communication
 - Use of the operational information system to process work orders and to obtain technical documents and information.
 - Presentation of facts
 - Communication with customers and safeguarding of previous and subsequent functional areas
 - Reading and implementation of repair, assembly, commissioning and operating instructions, catalogues, tables and diagrams

- Interpretation of technical information
- Planning and controlling of work processes, monitoring and assessment of work results
 - Planning and determination of work steps and procedures
 - Identification of working materials, operating materials and auxiliary materials
 - Requesting, providing and documenting parts requirements, materials, tools and aids for specific orders
 - Determination of time requirements
 - Preparation of the work place taking the assigned work into account
 - Monitoring, evaluation and documentation of work results using target/actual value comparisons and the proposal of measures to improve work results
 - Observation of manufacturer safety instructions, particularly for vehicles with alternative drive systems
- Quality management
 - Application of testing methods and testing equipment according to requirements
- Maintenance and servicing of operating materials
 - Cleaning and maintenance of operating resources

Training topic Diagnostic technology 1 — Electrical vehicle systems

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Operation of vehicles and systems	<ul style="list-style-type: none"> • Observation and implementation of instructions on safety and operation 	5%
1.2 Decommissioning and commissioning of vehicle technical systems	<ul style="list-style-type: none"> • Implementation of manufacturer-specific specifications, safety and protective measures, in particular, standards and regulations for electrical works on motor vehicles and high-voltage vehicles, as well as compliance with accident prevention regulations and technical rules • Identification of increased hazard potential in vehicles • Observation of safety specifications for high-voltage systems and securing of the work area • Disconnection of systems from the power supply in accordance with work instructions, securing systems to prevent reactivation, ensuring that no voltage is present • Verification of functionality and documentation of results • Assessment and analysis of electrotechnical hazards 	10 %
1.3 Measurement and testing of systems	<ul style="list-style-type: none"> • Obtaining target data, selection of suitable measuring methods • Implementation of protective measures against electrical current and electric arcs • Acquisition of measured values and comparison with target data, particularly with regard to the measurement, testing and evaluation of electrical and electronic quantities and signals on components, modules and systems 	35 %

Differentiation	Contents	Time allocation
	<ul style="list-style-type: none"> • Electrical connections, lines and line connections for mechanical damage. • Inspection of functionality of electrical components, lines and fuses • Documentation of test results 	
1.4 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Understanding customer complaints, implementation of functionality checks and definition of diagnostic paths • Determination of errors and their causes with the aid of circuit diagrams and function charts • Creation of test protocols and documentation of results • Inspection, evaluation of onboard, charging, starting and lighting systems and parameterisation according to customer requirements, documentation of results • Implementation of measures to avoid hazards due to insulation faults 	40 %
1.5 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Establishment, inspection, maintenance and documentation of electrical connections and terminals • Assembly and connection of electrical systems, inspection of functionality and provision of safety guarantees • Observation of electrotechnical safety rules when working 	10%

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.

- Operational, technical and customer-oriented communication
 - Use of the operational information system to process work orders and to obtain technical documents and information.
 - Conducting conversations according to the situation, presentation of facts and use of English technical terms
 - Communication with customers and safeguarding of previous and subsequent functional areas
 - Reading and application of circuit diagrams, connection diagrams, wiring diagrams, layout diagrams and function charts
- Planning and controlling of work processes, monitoring and assessment of work results
 - Monitoring, evaluation and documentation of work results using target/actual value comparisons and the proposal of measures to improve work results
 - Observation of manufacturer safety instructions, particularly for vehicles with alternative drive systems
- Quality management
 - Application of testing methods and testing equipment according to requirements
- Maintenance and servicing of operating materials
 - Cleaning and maintenance of operating resources

Diagnostic technology 2 Motor management

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Implementation of service and maintenance work	<ul style="list-style-type: none"> • Performance of adjustment work on vehicles and systems • Creation and interpretation of test and measurement protocols 	10 %
1.2 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Identification of system conditions using diagnostic systems, comparison with information in databases and evaluation of results • Determination and updating of control software, implementation of reset and basic settings on vehicle systems and adjustment of learning values • Performance of adjustment work on vehicles and systems • Determination of diagnostic and repair possibilities • Determination of causes of malfunctions with the aid of diagnostic systems • Inspection and diagnosis of drive units including engine management systems, exhaust systems and ancillary units 	65 %
1.3 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Identification of repair measures • Following diagnostics, Implementation of repair methods 	15 %
1.4 Implementation of vehicle inspections in accordance with legal requirements	<ul style="list-style-type: none"> • Preparation of vehicles for statutory tests • Determination of target and actual values using diagnostic systems recording of settings values, implementation of settings and documentation of results 	10 %

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measure sand observation of occupational safety and accident prevention regulations.
- Operational, technical and customer-oriented communication
 - Implementation of fault and damage analysis by means of a limited customer survey
 - Planning and controlling of work processes, monitoring and assessment of work results
 - Identification of correct testing equipment and determination of its use
 - Identification and logging of damage to adjacent components and modules and implementation of measures to remedy them
- Quality management
 - Review, evaluation and logging of one's own work results as well as those of others

Diagnostic technology 3 Chassis/brakes

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Implementation of service and maintenance work	<ul style="list-style-type: none">• Implementation of adjustment work on vehicles and systems• Creation and interpretation of test and measurement protocols	10 %

Differentiation	Contents	Time allocation
1.2 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Determination of diagnostic and repair possibilities • Determination of the causes of malfunctions in drive, chassis, comfort and safety systems with the aid of diagnostic systems • Performance of chassis measurement and the creation of measurement protocols • Testing and assessment of brake, chassis, spring, damping and level control systems 	55 %
1.3 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Reparation of chassis, suspension, damping and level control systems 	25%
1.4 Implementation of vehicle inspections in accordance with legal requirements	<ul style="list-style-type: none"> • Preparation of vehicles for statutory tests • Determination of the road worthiness and operational safety condition of motor vehicles, documentation of defects and the implementation of measures to eliminate them • Determination of target and actual values using diagnostic systems recording of settings values, implementation of settings and documentation of results 	10 %

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.
- Operational, technical and customer-oriented communication

- Reading and application of circuit diagrams, wiring diagrams, layout diagrams, function charts as well as reading and observation of function charts for pneumatic and hydraulic vehicle controls and power transmissions
- Quality management:
 - Review, evaluation and logging of one's own work results as well as those of others

Diagnostic technology 4 High voltage technology

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Operation of vehicles and systems	<ul style="list-style-type: none"> • Observation and implementation of instructions on safety and operation 	5 %
1.2 Decommissioning and commissioning of vehicle technical systems	<ul style="list-style-type: none"> • Manufacturer-specific specifications, safety and protective measures, in particular, standards and regulations for electrical works on motor vehicles and high-voltage vehicles, as well as compliance with accident prevention regulations and technical rules • Identification of increased hazard potential in vehicles • Observation of safety specifications for high-voltage systems and securing of the work area • Disconnection of systems from the power supply in accordance with work • Instructions, securing systems to prevent reactivation, ensuring that no voltage is 	40 %

Differentiation	Contents	Time allocation
	<p>present Verification of functionality and documentation of results</p> <ul style="list-style-type: none"> • Assessment and analysis of electrotechnical hazards • Ensuring vehicle systems are in a safe maintenance and repair condition, in particular, under observation of any potentially explosive substances, fuels, gases, liquids and electrical voltages. • Commissioning and decommissioning of vehicle technical and electrical systems 	
1.3 Measurement and testing of systems	<ul style="list-style-type: none"> • Observation of protective measures to prevent electric shocks and electrical arcs • Visual inspection of electrical connections, power lines and line connections for mechanical damage • Inspection of functionality of electrical components, lines and fuses • Testing and evaluation of earthing and equipotential bonding conductors • Measurement and evaluation of insulation resistances 	30 %
1.4 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Implementation of measures to combat hazards due to insulation faults • Use of expert systems in particular, with regard to guided troubleshooting, database and telephone diagnosis, hotline use 	10 %
1.5 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Establishment, inspection, maintenance and documentation of electrical connections and terminals • Assembly and connection of electrical systems, inspection of functionality and provision of safety guarantees 	15 %

Differentiation	Contents	Time allocation
	<ul style="list-style-type: none"> • Observation of electrical safety rules when working on electrical systems, in particular, on high voltage systems and fuel cells • Replacement of high voltage components 	

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.
- Planning and preparation of work processes as well as monitoring and evaluation of work results
 - Identification of correct testing equipment and determination of its use
 - Identification and logging of damage to adjacent components and modules and implementation of measures to remedy them
- Operational, technical and customer-oriented communication
 - Reading and application of circuit diagrams, connection diagrams, wiring diagrams, layout diagrams and function charts
 - Implementation, application and use of service information including from English language documents
- Quality management:
 - Review, evaluation and logging of one's own work results as well as those of others

Training topic Diagnostic technology 5 — Vehicle data transmission

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Implementation of service and maintenance work	<ul style="list-style-type: none"> • Creation and interpretation of test and measurement protocols 	10 %
1.2 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Identification of data communication between ECUs • Determination of system states with the help of diagnostic systems, comparison with information in databases and evaluation of results • Use of trouble shooting programs, manufacturer information and databases as well as hotlines and tele diagnostics • Determination and updating of control software, implementation of reset and basic settings on vehicle systems and adjustment of learning values • Recording and evaluation of data communication between ECUs • Identification and localisation of errors in wireless signal transmission systems 	65 %
1.3 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> • Reparation of electrical and optoelectronic data communication cables 	15 %

Differentiation	Contents	Time allocation
1.4 Equipping, modification and retrofitting of vehicles	<ul style="list-style-type: none"> • Integration of components and systems into the vehicle network • Coding and configuration of ECUs, updating software versions, documentation of changes • Upgrading of signal processing systems, components and circuits for optical transmission systems • Equipping of motor vehicles with wireless signal, transmission systems, antenna systems and entertainment electronics 	10 %

Integral parts

Additional knowledge and skills to be imparted in connection with the course:

- Observation and application of work safety, environmental protection and rational energy-use measures.
- Observation of occupational safety and accident prevention regulations.
- Quality management:
 - Review, evaluation and logging of one's own work results as well as those of others

Training topic Diagnostic technology 6 — Linked vehicle systems

The following qualifications should be taught in an action-oriented and interlinked manner on the basis of tasks that relate to customer orders.

Differentiation	Contents	Time allocation
1.1 Implementation of service and maintenance work	<ul style="list-style-type: none"> • Creation and interpretation of test and measurement protocols 	10 %
1.2 Diagnosis of faults and errors in vehicles and systems	<ul style="list-style-type: none"> • Identification of data communication between ECUs • Determination of system states with the help of diagnostic systems, comparison with information in databases and evaluation of results • Use of trouble shooting programs, manufacturer information and databases as well as hotlines and tele diagnostics • Determination and updating of control software, implementation of reset and basic settings on vehicle systems and adjustment of learning values • Determination of diagnostic and repair options based on the customer's order • Testing, evaluation and configuration of comfort, safety and driver assistance systems according to customer requirements, Documentation of results • Determination of the causes of malfunctions to the drive, chassis, comfort and safety systems with the aid of diagnostic systems • Testing and evaluation of body systems, in particular, locking systems, convertible roof systems and sliding roofs • Recording and evaluation of data communication between ECUs • Localisation of errors in wireless signal transmission systems 	65 %

Differentiation	Contents	Time allocation
	<ul style="list-style-type: none"> Use of expert systems in particular, with regard to guided troubleshooting, database and telephone diagnosis, hotline use 	
1.3 Disassembly, repair and assembly of components, modules and systems	<ul style="list-style-type: none"> Repairation of electrical and optoelectronic data communications lines 	15 %
1.4 Equipping, modification and retrofitting of vehicles	<ul style="list-style-type: none"> Integration of components and systems into the vehicle network Coding and configuration of ECUs, updating software versions, documentation of changes Upgrading of signal processing systems, components and circuits for optical transmission systems Equipping of motor vehicles with wireless signal transmission systems, antenna systems and entertainment electronics 	10 %

Integral parts

- Additional knowledge and skills to be imparted in connection with the course:
- Observation and application of work safety, environmental protection and rational energy-use measures. Observation of occupational safety and accident prevention regulations.
- Operational, technical and customer-oriented communication
 - Reading and application of circuit diagrams, connection diagrams, wiring diagrams, layout diagrams and function charts
 - Application and use of knowledge databases
- Quality management:

- Review, evaluation and logging of one's own work results as well as those of others

General acquisition of competences

Foreign language communication

Foreign language content should complement the theoretical learning modules in accordance with the profession's industry requirements. In order to take into account the automotive industry in particular, it is advisable to teach student's English as a lot of information and technical terms used by manufacturers are in English. The following approaches can be integrated into the modules or taught as an independent subject:

1. Summary of essential statements from foreign language texts (listening and reading)
 - a. Understanding and evaluation of regulations, rules and technical documents
 - b. Understanding and evaluation of manufacturer documents (plans, drawings)
 - c. Understanding and evaluation of information with regard to on-board electronics
 - d. Understanding and evaluation of regulations on occupational safety and environmental protection
 - e. Understanding and evaluation of customer complaints
2. Preparation of oral and written messages of all kinds in the foreign language
 - a. Description of typical tasks that are part of the vocational training
 - b. Presentation of results in a team
 - c. Creation of manuals and instructions for use for the customer

- d. Creation of work plans, documentation of work steps
 - e. Notification of the customer with regard to the condition of the vehicle and any defects or repairs
 - f. Documentation of customer complaints
3. Translation of texts, facts and problems from one language to the other
- a. Translation of operating and instruction manuals
 - b. Translation of measurement catalogues
4. Leading of conversations and the exchange of written messages in the foreign language
- a. Communication of shared experiences at the workplace and on the basis of work assignments
 - b. Exchanging of information with customers about the feasibility of the order and the explanation of any necessary additional work
 - c. Provision of consultation with customers

Acquisition of competence in economics and business administration

Apprentices who have completed their vocational training should be able to demonstrate that they understand, present and also assess general economic and social contexts in the world of work and professional employment. Therefore, a vocational education not only prepares students for a specific subject, but also for life. For this reason, the subject of economics and business administration should impart knowledge according to the following approaches:

1. Securing one's professional existence
 - a. Development of professional identity, development of professional prospects, also taking family planning into account
 - b. The seizing of opportunities to secure one's existence

- c. Balancing of entrepreneurial opportunities and risks
2. Assessment of costs
 - a. Planning of cost processes, analysis of personnel costs
 - b. Identification of costs and calculation of prices
 - c. Preparation of investment decisions and the assessment of the economic viability of other companies
3. Communication with customers and suppliers
 - a. Conclusion of contracts and the handling of contractual obligations
 - b. Identification of compensation claims
 - c. Instruction of customers in the use of products and services
 - d. Presentation of a company and promotion of its identity
 - e. Evaluation of competitive situations and the determination of a resulting course of action from them
4. Organisation of production processes / services (see also p. 23)
 - a. Planning and controlling of work processes
 - b. Conservation of resources
 - c. Development of work steps in humane manner
 - d. Ensuring quality standards
 - e. Organisation of material procurement and storage
 - f. Assessment of incentives resulting from remuneration systems
5. Best serving the interests of the company
 - a. Reflection of the individual roles in the company

- b. Observation of legal, collective bargaining and operational framework conditions
- c. Contributing to a positive working atmosphere
- d. Seizing of co-determination opportunities
- e. Representation of both individual and common rights

Acquisition of competence in the field of IT and Data processing

With regard to IT and data processing, trainees should be familiarised with current Microsoft Office applications and be able to operate them confidently.

Acquisition of competence in Politics and Social Studies

As part of the vocational training this acquisition of competence prepares students for the independent development of political judgement and the competence to act. This independent subject should be taught to the trainees according to the following approaches

1. Securing and developing democracy
 - a. Determination of the risks and the securing of fundamental and human rights, for example, demonstration of the value of due diligence at work and the formation of the student's own values from this - The influence of politics on the world around us
2. The opportunities and risks of internationalisation and globalisation
 - a. Identification of the consequences of the process of Europeanisation on politics, society and the economy
3. The safeguarding of peace and conflict resolution procedures

As a result of the integration of general competence acquisition, the school curriculum now totals 2132 teaching hours. Furthermore, the content learned as part

of the course should be practised and consolidated in the training organisation / company providing the internship.

		Teaching Year		Teaching Year		Teaching Year		Total teaching units
		1	2	3	4	5	6	
Vocational Theoretical Classes		1	2	3	4	5	6	
1	Service and inspect vehicles and systems according to specifications	40	40					80
2	Test, dismantle, exchange and assemble simple modules and systems	50	50					100
3	Identifying and eliminating functional problems	50	50					100
4	Implementation of retrofitting work according to customer requirements	20	20					40
5	Implementation of inspections and additional work			30	30			60
6	Diagnosis and rectification of malfunctions in on-board power systems, charging current			40	40			80

	systems and starting systems							
7	Repairing modules and systems exposed to wear and tear			30	30			60
8	Diagnosis of mechatronic drive management systems			40	40			80
9	Completion of service tasks on comfort and safety					40	40	80
10	Reparation of damages to chassis and braking systems					40	40	80
Specialisation								
11	Diagnosis and repair of networked drive, comfort and safety systems					40	40	80
12	Preparation of vehicles for safety tests and approvals					20	20	40
13	Reparation of drive components					40	40	80
14	Equipping, modification and					30	30	60

	retrofitting of systems and components							
Vocational practical classes — Basic level								
G-K1/15	Repair technology 1 - Vehicle electrical systems	40						40
G-K2/15	Repair technology 2 - Vehicle mechatronics	40						40
G-K3/15	Repair technology 3 - Service and maintenance of vehicles		40					40
G-K4/15	Repair technology 4 - Vehicle repair and maintenance		40					40
Vocational practical classes — Specialist level								
K1/15	Diagnostic technology 1 - Electrical vehicle systems			40				40
K2/15	Diagnostic technology 2 - Motor management			40				40

K3/15	Diagnostic technology 3 - Chassis/brakes				40			40
K4/15	Diagnostic technology 4 - High voltage technology				40			40
K5/15	Diagnostic technology 5 - Vehicle data transmission					40		40
K6/15	Diagnostic technology 6 - Linked vehicle systems						40	
Multi-vocational training								
1	Native language and communication	30	30	20	20	20	20	140
2	Religious education	10	10	10	10			40
3	IT and data processing	16	16	16	16	16	16	96
4	Politics and Social Studies	30	30	20	20	16	16	132

5	Foreign language communication	20	20	20	20	20	20	120
6	Economics and Business Management	24	24	24	24	24	24	144
7	Consideration of scientific laws	40	20	20				80
Total hours per half year		410	390	350	290	386	346	2132
Weeks per half year		12	11	10	8	11	10	59

Examination regulations for the training occupation of automotive mechatronics engineer¹

§ 1 Duration of vocational training

Training for the automotive mechatronics engineer and the automotive mechatronics technician lasts three and a half years.

§ 2 Training framework plan, vocational training profile

(1) The subject of vocational training shall be at least the skills, knowledge, and abilities (professional capacity) listed in the training framework (Annex). An organization of vocational training deviating from the training curriculum is particularly permissible insofar as practical operational peculiarities require the deviation.

(2) Vocational training as an automotive mechatronics engineer and automotive mechatronics technician is divided into

1. Profiling skills, knowledge, and abilities,
2. Integrative skills, knowledge, and abilities.

(3) Occupational profiling skills, knowledge, and abilities:

1. Operating vehicles and systems,
2. Decommissioning and commissioning of technical vehicle systems,
3. Measuring and testing on systems,
4. Carrying out service and maintenance work,
5. Diagnosing faults and malfunctions in vehicles and systems,
6. Disassembly, repair, and assembly of components, assemblies, and systems, conducting investigations on vehicles in accordance with legal requirements,
7. Removal, conversion and retrofitting of vehicles.

(4) Integrative skills, knowledge, and abilities are:

1. Vocational training, labour, and collective bargaining law,
2. Structure and organization of the training company,
3. Health and safety at work,
4. Environmental protection,
5. Planning and preparing work processes as well as checking and evaluating work results,
6. Operational and technical communication,
7. Implementation of quality assurance measures.

§ 3 Implementation of vocational training

(1) The skills, knowledge, and abilities specified in this Ordinance shall be arranged so that the trainees are enabled to pursue a qualified professional activity within the meaning of § 1 paragraph 3 of the Vocational Training Act, which in particular includes independent planning, implementation, and control. This qualification must also be demonstrated in tests in accordance with §§ 6 to 8.

(2) The trainers shall draw up a training plan on the basis of the training curriculum for the trainees.

¹ Bundesgesetzblatt Jahrgang 2013 Teil I Nr. 29, ausgegeben zu Bonn am 20. Juni 2013

- (3) Trainees shall hold written evidence of formal qualifications. They must be given the opportunity to obtain written evidence of formal qualifications during the training period. Trainees shall regularly review the written evidence of formal qualifications.

§ 4 Final examinations or journeyman's examination

The final examination or journeyman's exam consists of the two temporally separated parts 1 and 2. The final examination or journeyman's examination must determine whether the candidate has acquired the professional capacity to act. In the final examination or journeyman's examination, the candidate must prove that he/she has the necessary professional skills, possesses the necessary professional knowledge and abilities and is familiar with the teaching material essential for vocational training. Skills, knowledge, and abilities which were already the subject of Part 1 of the final examination or journeyman's examination should only be included in Part 2 of the final examination or journeyman's examination to the extent necessary to determine the professional qualification.

§ 5 Part 1 of the final or journeyman's examination

(1) Part 1 of the final or journeyman's examination shall take place before the end of the second year of training.

(2) Part 1 of the final exam or journeyman's examination covers the skills, knowledge, and abilities listed in the annex for the first

three semesters of training as well as the material to be taught in vocational education and training, insofar as it is essential for vocational training.

(3) Part 1 of the final or journeyman's examination consists of the examination area service order.

(4) The following requirements exist for the examination area:

a. The candidate should demonstrate that he/she can,

- 1 plan the work steps, to research data, to analyze circuit diagrams and functions,
- 2 to select work equipment and measuring devices, to carry out measurements, to document results,
- 3 maintenance requirements, in particular, the connection between technology, work organization, environmental protection as well as safety and health protection,
- 4 to present subject-related problems and their solutions, to identify the relevant technical backgrounds and to be able to justify the procedure for their implementation;

b. The test object should be connected to at least one of the following systems

- 1 Electrical system,
- 2 Lighting System,
- 3 Charging current system,
- 4 Starting system or
- 5 Brake mechanism

Performing measurements and tests, determining faults, malfunctions and their causes, preparing measurement or test reports, as well as dismantling, maintaining, assembling and drawing up documentation for a technical vehicle assembly;

c. By way of derogation from point 2, other activities may be used if they permit the verification referred to in point 1 to the same width and depth;

d. the candidate should perform a work task, which can consist of several subtasks and corresponds to customer orders, conduct a situational technical discussion, which can

consist of several discussion phases, and process tasks that relate to the work task in writing;

e. the examination time for the work task and the situational technical discussion is three hours; within this time, the situational technical discussion should last a maximum of ten minutes; the examination time for the written assignments is 120 minutes.

§ 6 Part 2 of the final or journeyman's examination

- (1) Part 2 of the final examination or journeyman's examination covers the skills, knowledge, and abilities listed in the Annex as well as the teaching material to be taught in vocational education and training, insofar as it is essential for vocational training.
- (2) Part 2 of the final examination or journeyman's examination consists of the examination areas:
 1. Customer order,
 2. Motor vehicle and maintenance technology,
 3. Diagnostics technology,
 4. Economics and Social Studies
- (3) The following requirements apply to the customer order check area:
 1. The candidate should prove that he is capable
 - a. to independently plan and implement work processes and to document the results,
 - b. use information systems to communicate with customers,
 - c. to operate and explain vehicles and systems,
 - d. disable and commission technical vehicle systems,
 - e. check system functions, use diagnostic systems, diagnose errors and malfunctions,
 - f. to repair or retrofit vehicles and their systems,
 - g. to document results, to prepare and analyze measurement and test protocols,
 - h. to present problems and their solutions and to point out technical backgrounds as well as to justify the procedure for the execution of the customer order;
 2. the following activities shall be taken as a basis for the verification referred to in point 1:
 2. Inspection of vehicles or vehicle systems according to manufacturer's specifications or road traffic regulations;
 - a. Diagnosing errors, malfunctions and their causes on at least one of the following systems:
 - i. Braking system,
 - ii. Chassis system,
 - iii. Power transmission system,
 - iv. Drive system,
 - v. Comfort system,
 - vi. Security system,
 - vii. High voltage system or
 - viii. networked systems;
 - b. Repair of vehicles or vehicle systems;
 3. other activities may be used if they permit the verification referred to in point 1 to the same width and depth;
 4. the candidate should work on three equivalent work tasks, which can consist of several subtasks and correspond to customer orders, as well as conduct a situational technical discussion, which can consist of several discussion phases;
 5. the examination time is five hours; within this time, the situational technical discussion should be conducted within a maximum of 20 minutes.
- (4) The following requirements exist for the motor vehicle and maintenance technology testing area:
 1. The candidate should demonstrate that he/she is able to,
 - a. describe motor vehicle systems and their functions,
 - b. Perform problem analysis, to analyze and evaluate technological and mathematical facts, present procedure and solutions,

- c. Apply safety, health and environmental protection regulations, licensing regulations and maintenance methods taking into account quality management and the principles of customer orientation and evaluate results,
 - d. select spare parts, tools, measuring and testing equipment as well as workshop equipment and aids required for maintenance in compliance with technical rules and manufacturer specifications,
 - e. to plan measures taking into account operational processes,
 - f. to use industry-specific software and evaluate data as well as
 - g. present electrotechnical work on high-voltage components in accordance with safety regulations;
2. the candidate is to work on tasks relating to customer orders in writing;
 3. the examination time is 120 minutes.
- (5) The following requirements apply to the diagnostic technology test area:
1. The candidate should demonstrate that he/she can,
 - a. Perform problem analysis, to analyze and evaluate technological and mathematical facts, present procedure and solutions,
 - b. Evaluate information from functional, circuit and networking plans, industry-specific software and manufacturer's instructions,
 - c. systematically isolate errors, malfunctions, and their causes,
 - d. use, evaluate and evaluate the results of the measuring, testing and diagnostic devices used as well as customer information,
 - e. to describe and analyze the interconnection of systems of the motor vehicle;
 2. the candidate is to work on tasks relating to customer orders in writing;
 3. the examination time is 120 minutes.
- (6) The following requirements apply to the area of economic and social studies:
1. The candidate should demonstrate that he/she can represent and judge the general economic and social contexts of the professional and working world;
 2. the candidate should work on practice-related tasks;
 3. the examination time is 60 minutes.

§ 7 Weighting and existence regulations

1. The examination areas are to be weighted as follows:
 - a. Service order with 35 percent,
 - b. Customer order with 35 percent,
 - c. Motor vehicle and maintenance technology with 10 percent,
 - d. Diagnostics technology with 10 percent,
 - e. Economic and social studies with 10 percent.
2. The final examination or the journeyman's examination is passed if the performance has been assessed as follows:
 - a. in the overall result of Part 1 and Part 2 of the final examination with at least "sufficient,"
 - b. in the inspection area customer order with at least "sufficient,"
 - c. in the result of Part 2 of the final examination with at least "sufficient,"
 - d. in at least two of the remaining examination areas of Part 2 of the final examination with at least "sufficient" and
 - e. in none of the examination areas of Part 2 of the final examination as "unsatisfactory."
3. At the request of the candidate, the examination in one of the examination areas automation and maintenance engineering, diagnostic technology or economic and social studies shall be supplemented by an oral examination of about 15 minutes, if
 - a. if the examination area has been rated as "insufficient" and

- b. the oral supplementary examination for the passing of the final exam can make the difference.

In the determination of the result for this examination area, the previous result and the result of the oral supplementary examination in a ratio of 2: 1 should be weighted.