

## Result 3.3

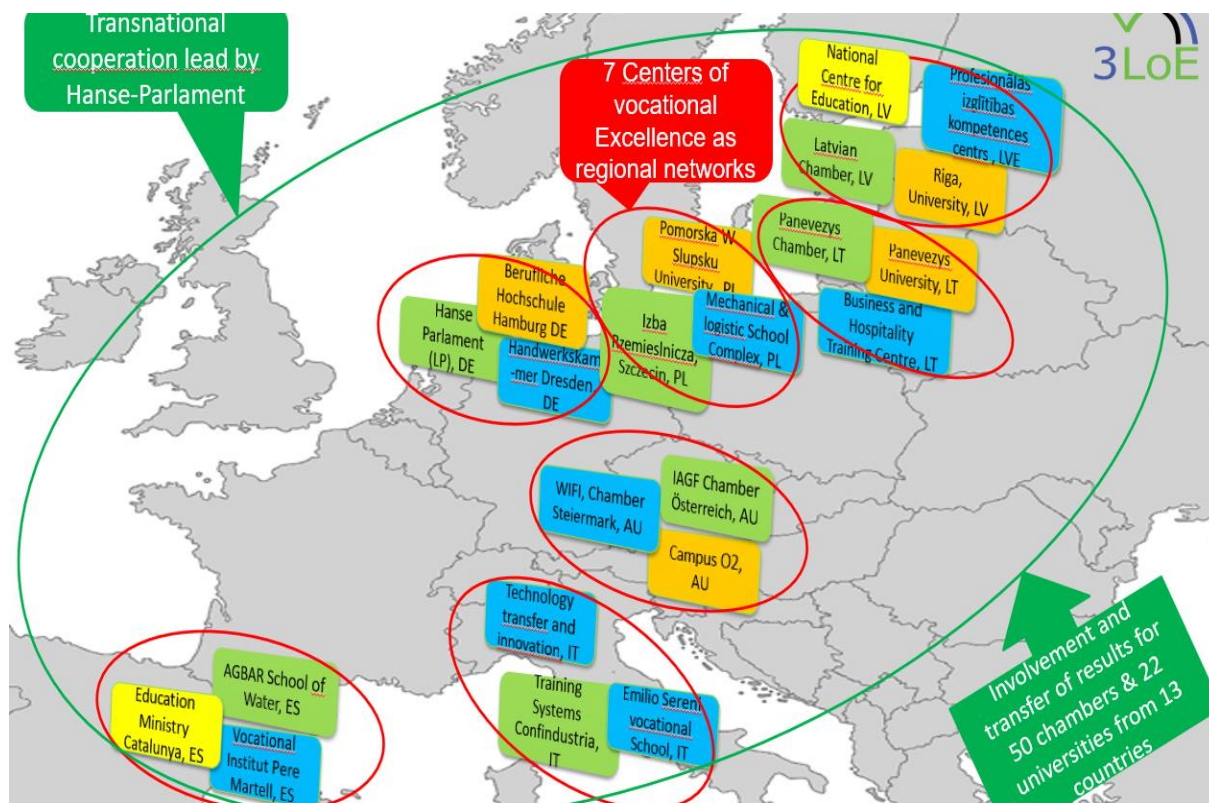
# Latvian Curriculum for dual vocational training for Motor vehicle mechanic/car mechanic



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## Partner



## Language

Polish

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## Summary of the Project and Introduction

### About the 3LOE Project

Around 99% of all EU businesses are SMEs, creating up to 70% of all jobs. In general, SMEs have good growth prospects for the future and are particularly well equipped to solve environmental problems and to enhance the green economy. However, in most of the project countries, SMEs are confronted with a shortage of skilled workers and young entrepreneurs. This shortage of skilled workers is even more alarming taking into account that due to aging of current entrepreneurs, a large and growing number of companies will have to be handed over to the next generation. Furthermore, young specialists and entrepreneurs often lack the qualifications and skills needed in order to respond to contemporary developments in the fields of energy, climate and environmental protection. The following problems have been identified in SMEs working in the fields of green economy, energy and environmental protection:

- Blatant and growing shortage of skilled workers.
- Large qualification deficits, especially in the Green Economy.
- Loss of attractiveness and low qualification of school-based VET.
- Low rates of further training and insufficient orientation of offers to SME needs.
- Ageing of entrepreneurs and increasing shortage of young people (demographic change).
- Failure of business transfers and low rates of business start-ups.
- Low innovation rates and insufficient productivity.
- Not enough cooperation between universities and SMEs and a lack of teaching geared to SME needs.
- Comparably low internationalization of SMEs and vocational training providers.
- Lack of national level support for SMEs”.

To meet these challenges, work-based learning and new paths in vocational training must be provided through cooperation between educational institutions, economic chambers and SMEs. University graduates are often well-qualified in theory, but lack practical knowledge, skills and abilities that are crucial for SMEs. For this reason, VET reforms must also involve higher education, and should implement dual bachelor's degree programs that combine a bachelor's degree with vocational training and on-site work in companies.

In the 3LOE project, an innovative and complex project structure with 22 project partners from 7 countries as well as 60 associated partners from 13 countries was designed. In each country, centers of vocational excellence (COVEs) in Green Economy will be established, managed and their permanent continuation ensured. A transnational cooperation of the centers will be developed, extended to 60 education stakeholders from 13 countries and operated permanently in an institutionalized form. The centers will offer a wide range of dual education measures in vocational training, further education and higher education, that are being developed, tested and evaluated in the project. These educational measures on EQF levels 3-7 focus on Green Economy, Digitalization and Entrepreneurship. Furthermore, vocational and educational consulting and innovation support for SMEs will be developed and implemented. In total, seven Train-the-Trainer programs will be developed and implemented permanently by the project partners. All results will be transferred to the 60 associated partners together with implementation advice.

The objectives and aimed outcomes of the 3LOE project can be summarized as following:

## **1. Foundation of a three-level Center in each project country**

1.1 Building the "Green Economy" skills alliance for qualifications in SMEs with educational and economic actors from the 7 project countries; development of information and cooperation tools.

1.2 Expansion of the skills alliance to the 60 associated partners from 13 countries, comprising chambers of commerce, SME associations, as well as universities of applied sciences/colleges.

1.3 Development, testing and evaluation of a curriculum and teaching materials for Train the Trainer courses for personnel and center management (vocational school-teachers, trainers in SMEs and lecturers in further and higher education institutions).

1.4 Evaluation of the construction and operation of the seven centers of Excellence and of the transnational cooperation.

1.5 Development of business and financing plans and ensuring the long-term continuation of the seven centres and transnational cooperation.

1.6 Development, consulting and introduction of political strategy program.

## **2. Implementation and realization vocational training**

2.1 Development and implementation of a tool for vocational and qualification counselling as well as a training for consultants and teachers to use the tool.

2.2 Implementation of the dual system, so that work-based learning is put into practice in the project countries.

Preparation and transfer of curricula and examination regulations for dual vocational training for different professions and implementations in Poland, Lithuania, Latvia and Spain.

Development, test and implementation Trainings for teachers to conduct dual vocational training as well as Training of trainers in SMEs.

2.3 Development political concept for the training and integration of young people with learning difficulties for young people with learning difficulties (EQF level 3).

Development, test and implementation of a dual vocational training "Specialist for Building Insulation".

2.4 Development, testing and evaluation of education programme, teaching materials and examination regulations for the provision of sector-specific qualifications already during the initial vocational training for stronger learners. Implementation in the dual system, so that work-based learning is put into practice in the project countries.

2.5 Development and implementation five-year technician training „Ecologic Solutions in Logistics”.

## **3. Implementation and realization of further vocational training**

3.1 Development and implementation of concepts and instruments for the management of continuing vocational training.

3.2 Development, test and implementation of a Train-the-Trainer program for teachers to conduct further training.

3.3 Development and implementation of a concept "SME-fair digitalization" as well as development, test and implementation of two train the trainer programs "Basic and advanced digital skills".

3.4 Transfer and implementation of four further trainings Energy Saving and Renewable Energies.

3.5 Preparation, transfer and implementation of six further trainings in the Green Economy.

3.6 Development, testing and evaluation of different training programs and teaching material for owners, managers and qualified workers of SMEs (EQF level 5 and 6).

The trainings are specifically tailored to SME needs and different qualification levels and combine the transfer of technical, professional and management know-how.

- Training Enterprise and Entrepreneurship in Green Economy
- Training Energy Service Manager
- Trainings vocational Master Carpenter and Electric
- Training Construction Technician
- Training Service Technician
- Training Sustainability in foodservice industry

3.7 Development of regulations for new continuing education occupational profiles with a focus on the green economy.

3.8 Development of an integration programme for the unemployed (EQF level 4) in order to be able to place the unemployed in permanent jobs through further training seminars and a further training qualification.

#### **4. Implementation and realization of higher education**

4.1 Preparation and transfer of curricula, evaluation and examination regulations for two existing dual Bachelor degree programmes "Management of Renewable Building Energy Technology" and "Business Administration for SMEs".

4.2 Development and beginning of implementation of new dual Bachelor degree programs

- Business Administration & Sustainable Management of SMEs
- Entrepreneurship and Innovation in Green Economy
- Logistics - Green Supply Chains
- Service technician
- Tutorial "Sustainable management Climate neutrality for companies"

4.3 Development, test and implementation of four study modules (EQF level 6) on SME management in the Green Economy sector, which will be carried out in the dual study system and integrated into existing Bachelor degree programmes.

4.4 Development and implementation of concept for innovation promotion Solutions for manageable R&D tasks of SMEs and conducting manageable R&D projects for SMEs-

4.5 Development, testing and implementation of Training program for university lecturers and SME advisors.

#### **5. Dissemination, transfer and use of the project results**

5.1 Development of a concept and summary evaluation of the dissemination results of all partners

5.2 Transfer of all educational measures to 60 educational institutions in 13 countries and needs-oriented implementation consultations as well as realization of a bundle of measures for further dissemination of the project results.

5.3 Further dissemination activities such as presentations online, at third-party events, press releases and conferences.

5.4 Book with all results of the project and distribution via book trade.

For each of the three levels of educational measures there will be:

- Target-group-specific educational programs.
- Curricula, teaching materials, etc. developed in a leading role by the educational institutions of the respective level, whereby the educational institutions of the other levels (in particular universities) participate in an advisory and supportive manner.
- Representatives of the participant target groups involved in the development work.



All educational measures will be tested with the respective target groups under different national conditions in the countries, evaluated and completed on the basis of the evaluation results with application notes.

All results will be transferred to the 60 associated partners together with implementation advice.

## About the transfer and implementation of dual vocational training systems

As part of the 3LoE project, dual vocational training was to be implemented in all seven partner countries. The basis for this was the German dual system, which was adapted to the respective national conditions and implemented.

The German dual system was analyzed and described in detail. Strategies were developed for the organization of vocational education and training in the federal states as well as recommendations for transfer and implementation in countries where school-based vocational education and training has been predominant to date. Comprehensive presentations were also developed to enable the partners to independently present, communicate and explain the dual system in their countries. The results of this work are summarized as Result 3.3 Curricula, teaching materials and examination regulations for specific dual vocational training, Part A Preparation and transfer of the German dual vocational training systems.

A train-the-trainer seminar for management and teaching staff at vocational schools was developed, trialed, evaluated and implemented to ensure that qualified staff are available in the implementing countries.<sup>1</sup>

In accordance with the focus of the 3LoE project in the Green Economy and the needs of the project partners, framework curricula for the school part and training regulations for the company part of vocational training as well as examination regulations for the following professions were prepared and transferred:

- Electronics technician for industrial engineering
- Vehicle mechatronics engineer
- Plumber
- Sewage engineering technician
- Environmental technology

These extensive documents were transferred electronically to all COVEs in German and in English translation, made available in Goggle drive and published on the project website for permanent use. Based on the German curricula, the international working groups developed country-specific curricula for dual vocational training for various occupations.

The Polish partner Izba Rzemieslnicza Malej i Sredniej Przesiebiorczosci wanted to realize a dual vocational training program "Fitter of fixtures and fittings in building industry" in accordance with national conditions and regional needs. As such a profession does not exist in Germany, the German vocational training programs "painter and varnisher" and "tiler and panel layer" were transferred. On this basis, the Polish partner developed and implemented a dual vocational training program "Fitter of fixtures and fittings in building industry" with comprehensive advice from Partner 1 Hanse-Parlament.

The Lithuanian partner Verslo ir svetingumo profesinés karjeros centras wanted to realize a two-year dual vocational training program "Cook" in accordance with national conditions and regional needs. As there is no such training program in Germany, the German vocational training programs "Cook" and "Ordinance in the hospitality

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<sup>1</sup> See Result 3.2 Training programs for teachers to conduct dual vocational training

services industry" were transferred. On this basis, the Lithuanian partner has developed and implemented a two-year dual vocational training program "Cook" with comprehensive advice from Partner 1 Hanse-Parlament.

As part of the further project implementation, dual vocational training programs were developed, implemented and evaluated for the following professions in the following countries:

- Poland: Electrician
- Poland: Fitter of fixtures and fittings in building industry
- Lithuania: Cook
- Latvia: Motor vehicle mechanic/Car mechanic
- Spain: Electromecanico

The implementation reports as well as an evaluation concept and evaluation reports are summarized as Result 3.3 Curricula, teaching materials and examination regulations for specific dual vocational training, Part B Implementation and Evaluation.

The entire Result 3.3 Curricula, teaching materials and examination regulations for specific dual vocational training consists of two parts:

- Part A Preparation and transfer of the German dual vocational training systems
- Part B Implementation and Evaluation

The German curricula for dual vocational training in five occupations have been published in German and English on the project website <https://3-loe.eu/>.

The Polish Curricula for dual vocational training for the professions "Electrician" and "Fitter of fixtures and fittings in building industry" were published on the project website <https://3-loe.eu/>.

The curriculum for the vocational training program "Motor vehicle mechanic/car mechanic" for Latvia is also published on the project website <https://3-loe.eu/>.

# Vocational training Motor vehicle mechanic/car me- chanic

## Curriculum



Work Package 3 First center level "Vocational training"

Activity A4.2 Preparation and transfer of curricula and examination  
regulations for dual vocational training

**Dual vocational training  
Motor vehicle mechanic /  
Motor vehicle mechatronics technician**

**Content**

German curricula for theoretical training at vocational school and for  
practical training in companies

German examination regulations

Polish curriculum for training "Motor vehicle mechanic"

# German curricula for theoretical training at vocational school and for practical training in companies

## Profession: Motor vehicle mechatronics technician

# Assignment of dual training as a vehicle mechatronics engineer - specialisation in passenger cars

## Teaching assignment

The vocational school and the training companies fulfil a joint educational role in dual vocational training. The vocational school is an independent place of learning. As an equal partner, it works together with all other parties involved in vocational training and has the task of conveying vocational and cross-vocational competence to students. This enables the students to fulfil the job-specific tasks relating to their profession and to help shape the world of work and society in a socially, economically and ecologically responsible manner, in particular, against a backdrop of ever-changing requirements. This includes the promotion of young people's competences

- for personal and structural reflection,
- for lifelong learning,
- for professional and individual flexibility / mobility with a view to European integration.

In order to fulfil its educational mandate, the vocational school must provide a differentiated educational offer, which:

- ✓ develops action-oriented learning arrangements in didactic planning for the school year that are coordinated with in-company training,
- ✓ allows inclusive lessons providing the corresponding level of individual support against the background of the students' different experiences, abilities and talents,
- ✓ sensitises students to health maintenance and specific accident risks at work, in private life and in society,
- ✓ demonstrates perspectives of different forms of employment, including entrepreneurial independence, in order to support self-reliant career and life planning,
- ✓ is geared to the relevant scientific findings and results with regard to competence development and skill assessment.

The central goal of vocational schools is to promote the development of comprehensive professional competences. Professional competence is understood as the willingness and ability of an individual to act appropriately in professional, social and private situations, in a well-thought-out manner, taking individual and social responsibility into account.

**Professional** competence is further developed in the areas of professional expertise, self-competence and social competence.

### **Professional expertise**

The willingness and ability to solve tasks and problems on the basis of technical knowledge and skills in a goal-oriented, appropriate, methodical and independent manner and the ability to appropriately evaluate results.

### **Self-competence**

The willingness and ability as an individual, to evaluate, think through and assess the development opportunities, requirements and restrictions present in family, work and public life, to develop one's own talents and to define and further develop life plans. It includes characteristics such as independence, the ability to handle feedback, self-confidence, reliability, responsibility and sense of duty. In particular, it includes an individual's development of well thought-out values as well as their independent commitment to them.

### **Social competence**

The willingness and ability to live and shape social relationships, to grasp and understand gratuities and tensions as well as the ability to deal with, communicate or confront others rationally and responsibly. This includes, in particular, the development of social responsibility and solidarity. Methodological competence, communicative competence and learning competence are an integral part of professional competence, self-competence and social competence.

### **Methodological competence**

The willingness and ability to work on tasks and problems in a goal-oriented, structured manner (e.g. when planning work steps)

### **Communicative competence**

The willingness and ability to understand and shape communicative situations. This includes perceiving, understanding and presenting one's own intentions and needs as well as those of any partners.

### **Learning competence**

The willingness and ability to understand, evaluate and classify information on facts and interrelationships independently and jointly with others in a conceptual manner. Learning competence includes, in particular, the ability and willingness to develop learning techniques and learning strategies both professionally and beyond the professional sphere and to use them for lifelong learning.

In order to fulfil the vocational school's educational mandate, young people are enabled to plan, carry out and assess work tasks independently within the scope of their professional activities. Studying at vocational school aims to develop comprehensive professional competences. With the didactically based practical implementation (or at least intellectual integration) of all phases of a vocational action taking place in learning situations, learning takes place both at and from work.

Activity-oriented teaching within the framework of the modular learning concept shown below is primarily oriented towards activity-oriented structures and represents a changed perspective compared to primarily subject-oriented teaching. According to learning theory and didactic findings, the following points of reference must be considered when planning and implementing activity-oriented lessons in learning situations:

- ✓ Didactic points of reference are situations that are important for the practice of the profession.
- ✓ Learning is accomplished via complete activities which are, if possible, performed independently or at least conceptually understood.
- ✓ Activities and actions promote a holistic understanding of professional reality, for example with regard to technical, safety, economic, legal, ecological and social aspects.
- ✓ Activities address learners' experiences and reflect them with regard to their social effects.
- ✓ Activities also consider social processes, for example the declaration of interests or conflict resolution, as well as different perspectives with regard to career and life planning.

## **1. The structure of vocational theoretical training**

The vocational theoretical training as a vehicle mechatronics engineer should be structured according to the following focal points, which extend over the 3-year training period:

### **Service**

This subject includes all modules which focus on service, maintenance and inspection activities, which may arise either as a result of manufacturer specifications or customer requirements. These concepts are derived from the typical industry understanding of such activities. When carrying out care, maintenance, inspection and additional work, the focus lies on maintaining the function and value of vehicles as well as complying with the relevant operational and work process-oriented workflows. The work process-oriented assignment of the corresponding modules follows the approach of a progressive curriculum over the course of the training years. With an increased training duration, the complexity, requirements and scope of the service work in the respective modules also increases, resulting in a higher level of competence. If the focus at the beginning of the training at the lowest level is on maintenance and standard service, the requirements increase with the duration of training, for example, at the highest level, the performance of inspections and inspections including additional work all the way up to inspections featuring special tests and approvals is included. As the duration of training increases, the higher-level modules also take an increased degree of independence in the work process into account. Descriptions of the core competences in the respective modules: The students acquire the competence to carry out maintenance and service work to maintain the function and value of vehicles and industry-specific systems according to manufacturer-related standards and customer requirements and to apply standardised instructions and simple rules according to specifications (LF 1). They carry out inspection work on vehicles and industry-specific systems independently, identifying any additional work steps required and integrating them into the work process in coordination with the regular inspection work (LF 5). The students plan service processes and carry out standardised service tasks on comfort and safety systems independently (LF 9). The students plan and carry out service tasks to prepare vehicles for safety tests and approvals within the framework of statutory regulations (LF 12).

## **Repair**

The subject includes all modules that focus on the repair of components, modules, assemblies and (sub)systems to maintain vehicle system functions or the operational condition of the vehicle. The work process-oriented assignment of the corresponding modules follows the approach of a progressive curriculum over the course of the training years. With an increased training duration, the complexity, requirements and scope of the repair work in the respective modules also increases, resulting in a higher level of competence. These increases are directly evident from the increasing complexity of the following activities; starting with an exchange repair according to standardised procedures and the assessment of wear status including determination of the repair effort involved, followed by complex damage analysis, repair and calculations, right up to the repair of complex vehicle systems based on comprehensive system knowledge. Descriptions of the core competences in the respective modules: Students acquire the competence to replace and repair components, modules and systems according to standardised instructions in order to maintain vehicle system functions (LF 2). They assess the condition of vehicle wear parts, replace components, modules and systems and determine the repair effort required (LF7). The students carry out damage analyses to determine the repair costs for chassis systems, determine repair costs, use repair methods and estimate the time and costs involved. The damage correction aims, in particular, to avoid consequential damages and the recurrence of damage (LF 10). The students repair drive components and use detailed specialist knowledge for system- and vehicle-related repair processes (LF 13).

## **Diagnostics**

The subject includes all modules which focus on the application of diagnostic strategies and the evaluation and repair of modules and systems resulting from their use. Diagnostics takes a closer look at the functional relationship between components and subsystems including their interrelationships in the system, particularly with regard to hybrid systems. In addition, the interdependencies in networked systems must also be considered from a safety-related standpoint. The work process-oriented assignment of the corresponding modules follows the approach of a progressive curriculum over the course of the training years. With an increased training duration, the complexity, requirements and scope of the diagnostic work in the respective modules also increases, resulting in a higher level of competence. These increases are directly evident from the increasing complexity of the activities; starting with simple diagnostic work using routine diagnostics to identify, locate and eliminate faults in electrical, electronic, hydraulic and pneumatic systems to ensure the functionality of the overall system. This is later followed by the diagnosis and analysis of malfunctions in complex electronic and mechatronic systems using independent and guided troubleshooting with the aid of diagnostic devices before cross-system, complex diagnoses in networked systems and the observation of data communication between ECUs with the help of expert systems is implemented. Descriptions of the core competences in the respective modules:

The students acquire the competence to identify faults in electrical, electronic, hydraulic and pneumatic systems, to systematically eliminate faults and to ensure the functionality of the overall system (LF 3). The students diagnose and repair malfunctions in power supply, storage and starting systems with the aid of manufacturer documentation and diagnostic devices (LF 6). The students identify malfunctions in complex drive technology control and regulation systems and eliminate them (LF 8). The students acquire the competence to carry out cross-system, complex diagnoses on networked drive, comfort and driver assistance systems, to analyse data communication between ECUs and to use expert systems for troubleshooting (LF 11).

## **Conversion and retrofitting**

The subject includes all modules which focus on the functional expansion of the vehicle or a subsystem as well as the provision of any supplementary equipment. These activities can result from manufacturer specifications as well as customer requirements. The work process-oriented assignment of the corresponding modules follows the approach of a progressive curriculum over the course of the training years. With an increased training duration, the complexity, requirements and scope of the conversion and retrofitting work in the respective modules also increases, resulting in a higher level of competence. At the beginning of the training, the main focus is on the implementation of customer requirements in the area of simple equipping and retrofitting work including subsequent preparation of the vehicle handover, whereby primarily simple activities are carried out, above all, in compliance with technical conditions and legal regulations. An increased complexity level is a direct outcome of the subsequent requirements for equipping and converting complex and networked systems as well as the necessary

systemic and technical adaptation work including final preparation of a subsequent customer briefing. Descriptions of the core competences in the respective modules:

The students convert and retrofit vehicle components and prepare the vehicle for handover to the customer, considering customer requirements, economic efficiency and legal regulations (LF 4). The students acquire the competence to identify customer-specific requests, to plan and implement conversion, extension and modification work on the basis of these whilst complying with manufacturer specifications and regulatory standards.

This leads to a module presentation within the field of the 4 main focus areas

<b>1. Teaching year</b>	<b>2. Teaching year</b>	<b>3. Teaching year</b>	
LF 1	LF 5	LF 9, LF 12	<b>Service</b>
LF 2	LF 7	LF 10, LF 13	<b>Repair</b>
LF 3	LF 6, LF 8	LF 11	<b>Diagnosis</b>
LF 4		LF 14	<b>Conversion and retrofitting</b>

Learning modules include the following contents which are taught in vocational theory lessons:



	Timing — Learning situations	Content
<p>Module 1</p> <p><b>Service and inspect vehicles and systems according to specifications</b></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"> <li>• Block diagrams</li> <li>• Flow diagrams</li> <li>• Maintenance instructions</li>   <li>• Sourcing</li> <li>• Standards, rules, regulations</li> <li>• Brake fluid</li> <li>• Disposal, recycling</li>   <li>• High voltage systems</li> <li>• Pyrotechnic systems</li> <li>• Hazardous/explosive/high pressure fluids (e.g. coolants)</li>   <li>Use of selected data processing devices <ul style="list-style-type: none"> <li>• Diagnosis</li> <li>• Test devices</li> <li>• Internet</li> </ul> </li>   <li>• Standard tool set</li> <li>• Special tools</li> </ul>

	Timing - Learning situations	Content
<p>Module 2</p> <p><b>Test, dismantle, exchange and assemble simple modules and systems</b></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"> <li>• Installation instructions</li> <li>• Repair instructions</li> <li>• Replacement part catalogues</li> <li>• Online information systems</li> <li>• Vocational regulations</li>   <li>• Brake mechanism</li> <li>• Exhaust system</li> <li>• Wheels and tyres</li>   <li>• Manufacturer keys</li> <li>• Coding of replacement parts</li>   <li>• Mechanics</li> <li>• Model types</li> <li>• Usage and assembly</li> <li>• Screw locks</li> <li>• Standards</li> <li>• Key parameters</li> <li>• Corrosion protection</li> <li>• Clamp connections</li> <li>• Rivet connections</li> <li>• Welded connections</li> <li>• Solder connections</li>   <li>• Disposal</li> <li>• Recycling</li> <li>• Exchange parts</li> <li>• Quality specifications</li> <li>• Wages and costs of spare parts</li> </ul>

		<ul style="list-style-type: none"> <li>• UVV (Accident prevention regulations)</li> <li>• Health hazards</li> <li>• Ecological consequences</li> </ul>
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	Timing - Learning situations	Content
<p>Module 3</p> <p><b>Identifying and eliminating functional problems</b></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> <p>Determination of physical sizes and use of suitable testing and measuring devices</p>	<ul style="list-style-type: none"> <li>• Reading of vehicle control unit error memories</li> <li>• Performance of visual inspections</li> <li>• Use of workshop information systems</li> <li>• Online information systems</li> </ul> <ul style="list-style-type: none"> <li>• Vehicle electrical systems</li> <li>• Lighting systems</li> </ul> <ul style="list-style-type: none"> <li>• Circuit diagrams / switching symbols</li> <li>• Connection and terminal designation</li> <li>• Troubleshooting guidelines</li> </ul> <ul style="list-style-type: none"> <li>• Safety</li> <li>• Line technology</li> <li>• Electrical and electronic basic circuits</li> <li>• Hydraulic and pneumatic switches</li> </ul> <ul style="list-style-type: none"> <li>• Activation, securing to prevent against being switched on again, ensuring that no voltage is present whilst observing the manufacturer's instructions.</li> </ul> <ul style="list-style-type: none"> <li>• Use of multimeters, current meters, pressure gauges, flow meters</li> </ul>

	Timing - Learning situations	Content
<p>Module 4</p> <p><b>Implementation of retrofitting work according to customer requirements</b></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"> <li>• Technical possibilities (additional features, functional integration)</li> <li>• Appropriate economic efficiency and legal obligations (registration certificate, road traffic licensing regulations)</li> <li>• Determination of technical requirements for assembly (mechanical, electrical)</li> <li>• Application of industry and standard software</li> </ul> <ul style="list-style-type: none"> <li>• Compilation of all necessary documents and components (instructions for use, general operating permit, entries, replaced components, invoice)</li> </ul>

	Timing - Learning situations	Content
<p>Module 5</p> <p><b>Implementation of inspections and additional work</b></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>	<ul style="list-style-type: none"> <li>• Engine mechanics</li> <li>• Engine control</li> <li>• Cooling and lubricating systems</li> </ul> <p>With assistance</p> <ul style="list-style-type: none"> <li>• Vehicle data and documents</li> <li>• Diagnostic devices</li> <li>• Integrated vehicle diagnostic systems</li> </ul>

	Planning of inspection and maintenance work	<ul style="list-style-type: none"> <li>• Workshop information</li> <li>• Web portals</li> <li>• Determination of the work sequence</li> <li>• Substantiated selection of tools, devices, testing and measuring devices</li> <li>• Causes of wear on vehicle systems and components (scientific principles)</li> </ul>
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	Timing - Learning situations	Content
<p>Module 6</p> <p><b>Diagnosis and rectification of malfunctions in on-board power systems, charging current systems and starting systems</b></p> <p>80 hours</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> <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"> <li>• Installation instructions</li> <li>• Repair instructions</li> <li>• Replacement part catalogues</li> <li>• Online information systems</li> <li>• Vocational regulations</li> <li>• Activation of high-voltage vehicles</li> <li>• Further development of own test routines</li> <li>• Application of circuit diagrams and function charts</li> <li>• Impact of possible errors on the overall system (battery management, start-stop system, pyrotechnic safety switches)</li> <li>• Operational planning of suitable measuring devices (multimeters, diagnostic tests)</li> <li>• Laws of voltage generation (induction)</li> <li>• Rectification (one-way, multi-way rectification)</li> <li>• Electric motor principles</li> <li>• Electrical energy storage</li> <li>• Starter, battery and generator parameters</li> </ul>
	Timing - Learning situations	Content

<p>Module 7</p> <p><b>Reparation of modules and systems exposed to wear and tear</b></p> <p>60 hours</p>	<p>Information retrieval with the help of technical documents 8 hours</p> <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"> <li>• Installation instructions</li> <li>• Repair instructions</li> <li>• Replacement part catalogues</li> <li>• Online information systems</li> <li>• Vocational regulations</li>   <li>• Brake mechanism</li> <li>• Exhaust system</li> <li>• Wheels and tyres</li>   <li>• Manufacturer keys</li> <li>• Replacement part coding</li>   <li>• Mechanics</li> <li>• Model types</li> <li>• Usage and assembly</li> <li>• Screw locks</li> <li>• Standards</li> <li>• Key parameters</li> <li>• Corrosion protection</li>   <li>• Clamp connections</li> <li>• Rivet joints</li> <li>• Welded connections</li> <li>• Solder connections</li>   <li>• Disposal</li> <li>• Recycling</li> <li>• Exchange parts</li> <li>• Quality specifications</li> </ul>
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		<ul style="list-style-type: none"> <li>• Wages and spare parts costs</li> <li>• UVV (Accident prevention regulations)</li> <li>• Health hazards</li> <li>• Ecological consequences</li> </ul>
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	Timing - Learning situations	Content
<b>Module 8</b>  <b>Diagnosis of mechatronic drive management systems</b>  80 hours	<p>Malfunctions based on error descriptions, by evaluating the 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 15 hours</p>	<ul style="list-style-type: none"> <li>• Actuator analysis</li> <li>• Repair instructions</li> <li>• Error diagnosis</li> <li>• Online information systems</li> <li>• Repair possibilities</li> </ul> <ul style="list-style-type: none"> <li>• Torque controlled engine management systems for gasoline and diesel engines</li> <li>• Hybrid systems</li> <li>• Electric drive units</li> <li>• Transmission clutches</li> </ul> <ul style="list-style-type: none"> <li>• Computer-integrated sensors and actuators (analog, digital)</li> </ul> <ul style="list-style-type: none"> <li>• Ignition</li> <li>• Carburetion</li> <li>• Supercharging</li> <li>• Exhaust system</li> <li>• Exhaust purification system</li> <li>• Control of drive subsystems and electric machines</li> </ul> <ul style="list-style-type: none"> <li>• Error memory entries and environmental conditions,</li> <li>• Actual values of actuators and sensors,</li> </ul>

	Comparison with database systems and evaluation of results 11 hours	<ul style="list-style-type: none"> <li>• Signal characteristics and characteristic values in ECUs, exhaust gas values,</li> <li>• System reactions</li>   <li>• Determination and documentation of</li> <li>• a systematic procedure and sequence of test steps, checking of sensors and actuators of the drive and motor management according to</li> <li>• manufacturer specifications, evaluation of signal images from</li> </ul>
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	Timing - Learning situations	Content
<p>Module 9</p> <p><b>Completion of service tasks on comfort and safety systems</b></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.          8 hours</p> <p>Analysis of the vehicle condition to determine the necessity of any additional work          6 hours</p> <p>Distinguish between measuring and testing methods on hydraulic, pneumatic and pyrotechnic systems and determine the relevant safety regulations          14 hours</p>	<ul style="list-style-type: none"> <li>• air conditioning,</li> <li>• comfort systems, active and passive safety systems,</li> <li>• Lubricant systems</li>   <li>• Leak testing and detection for filters and seals</li>   <li>• Coolants</li> <li>• Pressures,</li> <li>• Pyrotechnics,</li> <li>• Explosives law,</li> <li>• Regulations,</li> <li>• Disposal and recycling</li> </ul>

	<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"> <li>• A substantiated selection of tools, devices and measuring devices for service works,</li> <li>• Description of their use</li> <li>• Compliance with safety regulations when handling hazardous materials.</li> <li>• Determination of the material requirements for operating materials, auxiliary materials and spare parts</li> <li>• Planning of testing and adjustment work using manufacturer documents and data sheets</li>   <li>• Parts exchange</li> <li>• Parts repair,</li> <li>• System replacement</li>   <li>• A/C service units</li> <li>• Error memory</li>   <li>• Documentation of work processes and measurement results</li> <li>• Completion of customer and vehicle-specific service documents</li> <li>• Evaluation of works with regard to the</li> <li>• Improvement of operational and customer-oriented procedures</li> <li>• Recognition of conflicting goals between technical requirements, normative specifications and customer requirements</li> <li>• 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</li> </ul>
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	Timing - Learning situations	Content
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<p>Module 10</p> <p><b>Reparation of damages to chassis and braking systems</b></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 20 hours</p>	<ul style="list-style-type: none"> <li>• Steering</li> <li>• Mountings</li> <li>• Suspension</li> <li>• Damping</li> </ul> <ul style="list-style-type: none"> <li>• Anti-lock braking system,</li> <li>• Traction control system,</li> <li>• Electronic stability program,</li> <li>• Brake assistant</li> </ul> <ul style="list-style-type: none"> <li>• Team communication with regard to repair methods in accordance with legal requirements</li> <li>• Determination of measures to avoid consequential damages</li> <li>• Reaching of decisions on reuse in line with current value based on manufacturer specifications and customer requirements</li> </ul> <ul style="list-style-type: none"> <li>• Brake test stand</li> <li>• Wheel alignment work station</li> <li>• manufacturer specifications, evaluation of signal images from the use of tables and formulas</li> <li>• Review of the repair process with regard to quality and cost-effectiveness and the formulation of possible strategies for its improvement</li> </ul>
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	Timing - Learning situations	Content

<p>Module 11</p> <p><b>Diagnose and repair networked drive, comfort and safety systems</b></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> <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"> <li>• Comfort systems,</li> <li>• Safety and driver assistance systems,</li> <li>• Drive train</li> </ul> <ul style="list-style-type: none"> <li>• Manufacturer-specific network instructions and topology-guided and user-based diagnostics</li> </ul> <ul style="list-style-type: none"> <li>• BUS systems,</li> <li>• Voltage levels,</li> <li>• Clocking,</li> <li>• Line technology</li> </ul> <ul style="list-style-type: none"> <li>• Measured value blocks,</li> <li>• Actuator diagnosis,</li> <li>• Adaptation values</li> </ul> <ul style="list-style-type: none"> <li>• Students evaluate, and document measured values and signals as well as ECU parameters and generate error logs.</li> <li>• 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.</li> </ul>
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	Timing - Learning situations	Content

<p>Module 12</p> <p><b>Preparation of vehicles for safety tests and approvals</b> 40</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 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"> <li>• Investigation of vehicle relevant conditions</li> <li>• Preparation and documentation of checklists</li> <li>• Implementation of target value comparisons</li>   <li>• Main inspection,</li> <li>• Exhaust inspection,</li> <li>• Additional inspections,</li> <li>• Approvals,</li> <li>• Authorisation</li>   <li>• Type,</li> <li>• Scope,</li> <li>• Costs</li> </ul>
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	Timing - Learning situations	Content
<p>Module 13</p> <p><b>Reparation of drive components</b></p>	<p>Identification of workshop information systems and</p>	<ul style="list-style-type: none"> <li>• Engine mechanics,</li> <li>• Coupling,</li> <li>• Manual, torque converter and distribution gearboxes,</li> </ul>



80 hours	<p>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> <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"> <li>• Axle drives</li>   <li>• Oil loss,</li> <li>• Power deficiency,</li> <li>• Gear changes</li> <li>• Sounds</li>   <li>• Movement changes,</li> <li>• Power and torque transmission,</li> <li>• Gear transmission ratios,</li> <li>• Changing of the rotational direction,</li> <li>• Rotation and torque compensation</li>   <li>• Thermal expansion,</li> <li>• Force diagrams,</li> <li>• Torque curves,</li> <li>• Transmission ratios,</li> <li>• Clutch slippage</li>   <li>• Comparison of repair costs</li> <li>• Evaluation of replacement costs</li> <li>• Informing the customer of the advantages and disadvantages of various repair solutions</li> <li>• Consultation with regard to the repairs to be carried out</li> <li>• Implementation of test routines before vehicle handover</li> </ul>
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	Timing — Modules	Content
Module 14		<ul style="list-style-type: none"> <li>• Lighting systems,</li> </ul>

<p><b>Equipping, modification and retrofitting of systems and components</b> 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> <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>	<ul style="list-style-type: none"> <li>• Gas powered systems,</li> <li>• Wireless signal transmission,</li> <li>• Antenna systems,</li> <li>• Entertainment electronics),</li>   <li>• mechanical, electrical features</li> <li>• Compliance with technical documents and industry-standard information systems</li> <li>• Observance of safety regulations (technical, traffic-related and operating safety guidelines as well as ergonomic requirements)</li>   <li>• Labour costs,</li> <li>• Parts costs</li>   <li>• Integration, familiarisation, activation, coding</li> <li>• Selection of suitable tools, devices and measuring devices for the conversion and retrofitting work</li> <li>• Observance of the relevant specifications, rules and regulations (technical, traffic and safety standards for the protection of persons)</li>   <li>• Documentation of work procedures and completion of vehicle-specific documents (general operating permit, approvals, entries)</li> <li>• Implementation of the handover, briefing and familiarisation of the customer with the handling</li> <li>• Development of customer-oriented consultancy forms</li> <li>• Evaluation of student's work with regard to the improvement of operational and customer-oriented approaches and communication</li> <li>• Identification of conflicting interests between technical requirements, normative specifications and customer wishes and contribute to their solution during</li> </ul>
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## 2. 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		Total teaching units
		1	2	3	4	5	6	
<b>Vocational theoretical classes</b>								
<b>1</b>	Service and inspect vehicles and systems according to specifications	40	40					80
<b>2</b>	Test, dismantle, exchange and assemble simple modules and systems	50	50					100
<b>3</b>	Identifying and eliminating functional problems	50	50					100
<b>4</b>	Implementation of retrofitting work according to customer requirements	20	20					40
<b>5</b>	Implementation of inspections and additional work			30	30			60
<b>6</b>	Diagnosis and rectification of malfunctions in on-board power systems, charging current systems and starting systems			40	40			80
<b>7</b>	Repairing modules and systems exposed to wear and tear			30	30			60
<b>8</b>	Diagnosis of mechatronic drive management systems			40	40			80
<b>9</b>	Completion of service tasks on comfort and safety					40	40	80
<b>10</b>	Reparation of damages to chassis and braking systems					40	40	80
Specialisation								

<b>11</b>	Diagnosis and repair of networked drive, comfort and safety systems					40	40	80
<b>12</b>	Preparation of vehicles for safety tests and approvals					20	20	40
<b>13</b>	Reparation of drive components					40	40	80
<b>14</b>	Equipping, modification and retrofitting of systems and components					30	30	60
<b>Vocational practical classes — Basic level</b>								
<b>G-K1/15</b>	Repair technology 1 - Vehicle electrical systems	40						40
<b>G-K2/15</b>	Repair technology 2 - Vehicle mechatronics	40						40
<b>G-K3/15</b>	Repair technology 3 - Service and maintenance of vehicles		40					40
<b>G-K4/15</b>	Repair technology 4 - Vehicle repair and maintenance		40					40
<b>Vocational practical classes — Specialist level</b>								
<b>K1/15</b>	Diagnostic technology 1 - Electrical vehicle systems			40				40
<b>K2/15</b>	Diagnostic technology 2 - Motor management			40				40
<b>K3/15</b>	Diagnostic technology 3 - Chassis/brakes				40			40
<b>K4/15</b>	Diagnostic technology 4 - High voltage technology				40			40
<b>K5/15</b>	Diagnostic technology 5 - Vehicle data transmission					40		40
<b>K6/15</b>	Diagnostic technology 6 - Linked vehicle systems						40	40

Total-teaching units of theoretical and practical vocational training classes

**1420**

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.



1.

## 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 manufacturer-specific specifications, safety regulations 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	10 %
1.2 Measurement and testing of systems	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	Circuit diagrams and function charts and inspection of electrical lines, connections and mechanical connections in vehicles  Documentation of work steps as well as test and measurement results	10 %
1.4 Diagnosis of faults and errors in vehicles and systems	Understanding customer complaints  Identification of damage and malfunctions to electrical	15 %

	<p>and electronic systems of vehicles and their components</p> <p>Determination of errors and their causes with the aid of circuit diagrams and function charts</p> <p>Creation of test protocols and documentation of results</p>	
3.5 Disassembly, repair and assembly of components, modules and systems	<p>Dismantling and disassembly of components</p> <p>Assembly of components and functionality testing</p> <p>Inspection, repair and documentation of electrical connections and terminals</p>	25%

## Integral parts

Additional knowledge and skills to be imparted within the context of 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
- 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
  - Compliance with the manufacturer's safety instructions
- 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

### 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	<p>Observation and implementation of safety and operations regulations and guidelines</p> <p>Application and explanation of operating instructions</p> <p>Handling of vehicle and system controls</p>	5 %
1.2 Decommissioning and commissioning of vehicle technical systems	<p>Implementation of manufacturer-specific specifications, accident prevention regulations and technical rules</p> <p>Verification of functionality and documentation of results</p>	5 %
1.3 Measurement and testing of systems	<p>Identification of target data, selection of measuring methods and instruments</p> <p>Recording and evaluation of measured values with target data</p> <p>Measurement and testing of physical parameters, particularly pressures and temperatures</p> <p>Documentation of test results</p>	35 %
1.4 Implementation of service and maintenance work	<p>Implementation of work and safety rules</p> <p>Inspection of mechanical modules and systems for wear, damage, impermeability, positional deviations and functionality</p> <p>Implementation of circuit diagrams and function charts Inspection of hydraulic, pneumatic and electrical lines, connections and mechanical connections</p> <p>Performance of functionality checks and documentation of work steps as well as testing and measurement results</p>	15 %

1.5 Diagnosis of errors and faults in vehicles and systems	<p>Understanding customer complaints, performance of functionality checks</p> <p>Identification of damage and malfunctions to mechanical, mechatronic and pneumatic systems of vehicles and their components</p> <p>Identification of errors and their causes with the aid of functional plans</p> <p>Creation of test protocols and documentation of results</p>	15 %
1.6 Disassembly, repair and assembly of components, modules and systems	<p>Decommissioning, disassembly, recyclability, labelling and systematic storage of components, modules and systems</p> <p>Assembly of components, modules and systems, commissioning and inspection of functionality and dimensional accuracy</p>	25%

## 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	Menu navigation and use of information, communications, comfort and safety systems	5 %
1.2 Decommissioning and commissioning of vehicle technical systems	Application of manufacturer-specific guidelines  Verification of functionality and documentation of results	5 %
1.3 Measurement and testing of systems	Electrical connections, Inspection of lines and line connections for mechanical damage  Documentation of test results	20 %
1.4 Implementation of service and maintenance work	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  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	<p>Understanding customer complaints, implementation of functionality checks</p> <p>Creation of test protocols and documentation of results</p> <p>Identification of data communication between ECUs</p>	15 %
1.6 Disassembly, repair and assembly of components, modules and systems	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 of vehicle technical systems	<p>Implementation of manufacturer-specific guidelines and accident prevention regulations</p> <p>Verification of functionality and documentation of results</p>	5 %
1.2 Measurement and testing of systems	<p>Obtaining target data, selection of suitable measuring methods</p> <p>Suitable selection of measuring tools for measuring and checking lengths, angles and surfaces</p> <p>Measurement of lengths, in particular with callipers, gauges and dial gauges, verification of compliance with tolerances and fits</p> <p>Verification of work pieces with angles, limit gauges and thread gauges</p> <p>Documentation of test results</p>	25%
1.3 Implementation of service and maintenance work	<p>Inspection of mechanical modules and systems for wear, Inspection for damages, leak tightness, positional variations and functionality</p>	5 %
1.4 Diagnosis of faults and errors in vehicles and systems	<p>Understanding customer complaints, implementation of functionality checks and definition of diagnostic paths</p> <p>Determination of damage and malfunctions to mechanical components</p> <p>Creation of test protocols and documentation of results</p>	20 %
1.5 Disassembly, repair and assembly of components, modules and systems	<p>Decommissioning of components, modules and systems, dismantling, disassembly and identification of substances hazardous to safety and health, determination of reusability, labelling and systematic storage.</p>	45 %

	<p>Allocation of disassembled components and modules systems and verification of completeness Cleaning, sanitisation, preservation and storage of components and modules</p> <p>Assembly of components, modules and systems, especially screw connections whilst considering the parts sequence and the torque</p> <p>Assembly of components, modules and systems, commissioning and inspection of functionality and dimensional accuracy</p> <p>Marking and centering of reference lines, hole centres and outlines considering the material properties, drilling and installation of work pieces, producing and repairing internal and external threads</p> <p>Reparation of components and systems subject to wear, in particular, brakes</p>	
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## 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	Observation and implementation of instructions on safety and operation	5 %
1.2 Decommissioning and commissioning of vehicle technical systems	<p>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</p> <p>Identification of increased hazard potential in vehicles</p> <p>Observation of safety specifications for high-voltage systems and securing of the work area</p> <p>Disconnection of systems from the power supply in accordance with work instructions, securing systems to prevent re-activation, ensuring that no voltage is present</p> <p>Verification of functionality and documentation of results</p> <p>Assessment and analysis of electrotechnical hazards</p>	10 %
1.3 Measurement and testing of systems	<p>Obtaining target data, selection of suitable measuring methods</p> <p>Implementation of protective measures against electrical current and electric arcs</p> <p>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</p>	35 %

	<p>Electrical connections, lines and line connections for mechanical damage.</p> <p>Inspection of functionality of electrical components, lines and fuses</p> <p>Documentation of test results</p>	
1.4 Diagnosis of faults and errors in vehicles and systems	<p>Understanding customer complaints, implementation of functionality checks and definition of diagnostic paths</p> <p>Determination of errors and their causes with the aid of circuit diagrams and function charts</p> <p>Creation of test protocols and documentation of results</p> <p>Inspection, evaluation of on-board, charging, starting and lighting systems and parameterisation according to customer requirements, documentation of results</p> <p>Implementation of measures to avoid hazards due to insulation faults</p>	40 %
1.5 Disassembly, repair and assembly of components, modules and systems	<p>Establishment, inspection, maintenance and documentation of electrical connections and terminals</p> <p>Assembly and connection of electrical systems, inspection of functionality and provision of safety guarantees</p> <p>Observation of electrotechnical safety rules when working</p>	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

## Training topic

### 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	<p>Performance of adjustment work on vehicles and systems</p> <p>Creation and interpretation of test and measurement protocols</p>	10 %
1.2 Diagnosis of faults and errors in vehicles and systems	<p>Identification of system conditions using diagnostic systems, comparison with information in databases and evaluation of results</p> <p>Determination and updating of control software, implementation of reset and basic settings on vehicle systems and adjustment of learning values</p> <p>Performance of adjustment work on vehicles and systems</p> <p>Determination of diagnostic and repair possibilities</p> <p>Determination of causes of malfunctions with the aid of diagnostic systems</p> <p>Inspection and diagnosis of drive units including engine management systems, exhaust systems and ancillary units</p>	65 %
1.3 Disassembly, repair and assembly of components, modules and systems	<p>Identification of repair measures following diagnostics, Implementation of repair methods</p>	15 %
1.4 Implementation of vehicle inspections in accordance with legal requirements	<p>Preparation of vehicles for statutory tests</p> <p>Determination of target and actual values using diagnostic systems recording of settings values, implementation of settings and documentation of results</p>	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
  - 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

## Training topic

### 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	<p>Implementation of adjustment work on vehicles and systems</p> <p>Creation and interpretation of test and measurement protocols</p>	10 %
1.2 Diagnosis of faults and errors in vehicles and systems	<p>Determination of diagnostic and repair possibilities</p> <p>Determination of the causes of malfunctions in drive, chassis, comfort and safety systems with the aid of diagnostic systems</p> <p>Performance of chassis measurement and the creation of measurement protocols</p> <p>Testing and assessment of brake, chassis, spring, damping and level control systems</p>	55 %
1.3 Disassembly, repair and assembly of components, modules and systems	<p>Reparation of chassis, suspension, damping and level control systems</p>	25%
1.4 Implementation of vehicle inspections in accordance with legal requirements	<p>Preparation of vehicles for statutory tests</p> <p>Determination of the road worthiness and operational safety condition of motor vehicles, documentation of defects and the implementation of measures to eliminate them</p> <p>Determination of target and actual values using diagnostic systems recording of settings values, implementation of settings and documentation of results</p>	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



## Training topic

### 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	Observation and implementation of instructions on safety and operation	5 %
1.2 Decommissioning and commissioning of vehicle technical systems	<p>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</p> <p>Identification of increased hazard potential in vehicles</p> <p>Observation of safety specifications for high-voltage systems and securing of the work area</p> <p>Disconnection of systems from the power supply in accordance with work instructions, securing systems to prevent re-activation, ensuring that no voltage is present Verification of functionality and documentation of results</p> <p>Assessment and analysis of electrotechnical hazards</p> <p>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.</p> <p>Commissioning and decommissioning of vehicle technical and electrical systems</p>	40 %
1.3 Measurement and testing of systems	<p>Observation of protective measures to prevent electric shocks and electrical arcs</p> <p>Visual inspection of electrical connections, power lines and</p>	30 %

	<p>line connections for mechanical damage</p> <p>Inspection of functionality of electrical components, lines and fuses</p> <p>Testing and evaluation of earthing and equipotential bonding conductors</p> <p>Measurement and evaluation of insulation resistances</p>	
1.4 Diagnosis of faults and errors in vehicles and systems	<p>Implementation of measures to combat hazards due to insulation faults</p> <p>Use of expert systems in particular, with regard to guided troubleshooting, database and telephone diagnosis, hotline use</p>	10 %
1.5 Disassembly, repair and assembly of components, modules and systems	<p>Establishment, inspection, maintenance and documentation of electrical connections and terminals</p> <p>Assembly and connection of electrical systems, inspection of functionality and provision of safety guarantees</p> <p>Observation of electrical safety rules when working on electrical systems, in particular, on high voltage systems and fuel cells</p> <p>Replacement of high voltage components</p>	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.
- 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	Creation and interpretation of test and measurement protocols	10 %
1.2 Diagnosis of faults and errors in vehicles and systems	<p>Identification of data communication between ECUs</p> <p>Determination of system states with the help of diagnostic systems, comparison with information in databases and evaluation of results</p> <p>Use of trouble shooting programs, manufacturer information and databases as well as hotlines and tele diagnostics</p> <p>Determination and updating of control software, implementation of reset and basic settings on vehicle systems and adjustment of learning values</p> <p>Recording and evaluation of data communication between ECUs</p> <p>Identification and localisation of errors in wireless signal transmission systems</p>	65 %
1.3 Disassembly, repair and assembly of components, modules and systems	Reparation of electrical and optoelectronic data communication cables	15 %
1.4 Equipping, modification and retrofitting of vehicles	<p>Integration of components and systems into the vehicle network</p> <p>Coding and configuration of ECUs, updating software versions, documentation of changes</p> <p>Upgrading of signal processing systems, components and circuits for optical transmission systems</p> <p>Equipping of motor vehicles with wireless signal</p>	10 %

	transmission systems, antenna systems and entertainment electronics	
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## 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	Creation and interpretation of test and measurement protocols	10 %
1.2 Diagnosis of faults and errors in vehicles and systems	<p>Identification of data communication between ECUs</p> <p>Determination of system states with the help of diagnostic systems, comparison with information in databases and evaluation of results</p> <p>Use of trouble shooting programs, manufacturer information and databases as well as hotlines and tele diagnostics</p> <p>Determination and updating of control software, implementation of reset and basic settings on vehicle systems and adjustment of learning values</p> <p>Determination of diagnostic and repair options based on the customer's order</p> <p>Testing, evaluation and configuration of comfort, safety and driver assistance systems according to customer requirements, Documentation of results</p> <p>Determination of the causes of malfunctions to the drive, chassis, comfort and safety systems with the aid of diagnostic systems</p> <p>Testing and evaluation of body systems, in particular, locking systems, convertible roof systems and sliding roofs</p> <p>Recording and evaluation of data communication between ECUs</p>	65 %

	<p>Localisation of errors in wireless signal transmission systems</p> <p>Use of expert systems in particular, with regard to guided troubleshooting, database and telephone diagnosis, hotline use</p>	
1.3 Disassembly, repair and assembly of components, modules and systems	Reparation of electrical and optoelectronic data communications lines	15 %
1.4 Equipping, modification and retrofitting of vehicles	<p>Integration of components and systems into the vehicle network</p> <p>Coding and configuration of ECUs, updating software versions, documentation of changes</p> <p>Upgrading of signal processing systems, components and circuits for optical transmission systems</p> <p>Equipping of motor vehicles with wireless signal transmission systems, antenna systems and entertainment electronics</p>	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

## 3. General acquisition of competences

### 3.1 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:

- a. Summary of essential statements from foreign language texts (listening and reading)
  - Understanding and evaluation of regulations, rules and technical documents
  - Understanding and evaluation of manufacturer documents (plans, drawings)
  - Understanding and evaluation of information with regard to on-board electronics
  - Understanding and evaluation of regulations on occupational safety and environmental protection
  - Understanding and evaluation of customer complaints
- b. Preparation of oral and written messages of all kinds in the foreign language
  - Description of typical tasks that are part of the vocational training
  - Presentation of results in a team
  - Creation of manuals and instructions for use for the customer
  - Creation of work plans, documentation of work steps
  - Notification of the customer with regard to the condition of the vehicle and any defects or repairs
  - Documentation of customer complaints
- c. Translation of texts, facts and problems from one language to the other
  - Translation of operating and instruction manuals
  - Translation of measurement catalogues
- d. Leading of conversations and the exchange of written messages in the foreign language
  - Communication of shared experiences at the workplace and on the basis of work assignments
  - Exchanging of information with customers about the feasibility of the order and the explanation of any necessary additional work
  - Provision of consultation with customers

### 3.2 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:

- a. Securing one's professional existence
  - Development of professional identity, development of professional prospects, also taking family planning into account
  - The seizing of opportunities to secure one's existence
  - Balancing of entrepreneurial opportunities and risks
- b. Assessment of costs
  - Planning of cost processes, analysis of personnel costs
  - Identification of costs and calculation of prices

- Preparation of investment decisions and the assessment of the economic viability of other companies
- c. Communication with customers and suppliers
  - Conclusion of contracts and the handling of contractual obligations
  - Identification of compensation claims
  - Instruction of customers in the use of products and services
  - Presentation of a company and promotion of its identity
  - Evaluation of competitive situations and the determination of a resulting course of action from them
- d. Organisation of production processes / services (see also p. 23)
  - Planning and controlling of work processes
  - Conservation of resources
  - Development of work steps in humane manner
  - Ensuring quality standards
  - Organisation of material procurement and storage
  - Assessment of incentives resulting from remuneration systems
- e. Best serving the interests of the company
  - Reflection of the individual roles in the company
  - Observation of legal, collective bargaining and operational framework conditions
  - Contributing to a positive working atmosphere
  - Seizing of co-determination opportunities
  - Representation of both individual and common rights

### **3.3 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.

### **3.4 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

- a. Securing and developing democracy
  - 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
- b. The opportunities and risks of internationalisation and globalisation
  - Identification of the consequences of the process of Europeanisation on politics, society and the economy
- c. 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 1		Teaching year 2		Teaching year 3		
		1	2	3	4	5	6	
<b>Vocational theoretical classes</b>								<b>Total</b>
<b>1</b>	Service and inspect vehicles and systems according to specifications	40	40					<b>80</b>
<b>2</b>	Test, dismantle, exchange and assemble simple modules and systems	50	50					<b>100</b>
<b>3</b>	Identifying and eliminating functional problems	50	50					<b>100</b>
<b>4</b>	Implementation of retrofitting work according to customer requirements	20	20					<b>40</b>
<b>5</b>	Implementation of inspections and additional work			30	30			<b>60</b>
<b>6</b>	Diagnosis and rectification of malfunctions in on-board power systems, charging current systems and starting systems			40	40			<b>80</b>
<b>7</b>	Reparation of modules and systems exposed to wear and tear			30	30			<b>60</b>
<b>8</b>	Diagnosis of mechatronic drive management systems			40	40			<b>80</b>
<b>9</b>	Completion of service tasks on comfort and safety					40	40	<b>80</b>
<b>10</b>	Reparation of damages to chassis and braking systems					40	40	<b>80</b>
Specialisation								
<b>11</b>	Diagnosis and repair of networked drive, comfort and safety systems					40	40	<b>80</b>
<b>12</b>	Preparation of vehicles for safety tests and approvals					20	20	<b>40</b>
<b>13</b>	Reparation of drive components					40	40	<b>80</b>

<b>14</b>	Equipping, modification and retrofitting of systems and components						30	30	<b>60</b>
<b>Vocational practical classes - Basic level</b>									
<b>G-K1/15</b>	Repair technology — Vehicle electrical systems	40							<b>40</b>
<b>G-K2/15</b>	Repair technology — Vehicle mechatronics	40							<b>40</b>
<b>G-K3/15</b>	Repair technology - Service and maintenance of vehicles		40						<b>40</b>
<b>G-K4/15</b>	Repair technology - Vehicle repair and maintenance		40						<b>40</b>
<b>Vocational practical classes - Specialist level</b>									
<b>K1/15</b>	Diagnostic technology 1 - Electrical vehicle systems			40					<b>40</b>
<b>K2/15</b>	Diagnostic technology 2 - Motor management			40					<b>40</b>
<b>K3/15</b>	Diagnostic technology 3 - Chassis/brakes				40				<b>40</b>
<b>K4/15</b>	Diagnostic technology 4 - High voltage technology					40			<b>40</b>
<b>K5/15</b>	Diagnostic technology 5 - Vehicle data transmission					40			<b>40</b>
<b>K6/15</b>	Diagnostic technology 6 - Linked vehicle systems						40		
<b>Multi-vocational training</b>									
<b>1</b>	Native language and communication	30	30	20	20	20	20	20	<b>140</b>
<b>2</b>	Religious education	10	10	10	10				<b>40</b>
<b>3</b>	IT and data processing	16	16	16	16	16	16		<b>96</b>
<b>4</b>	Politics and Social Studies	30	30	20	20	16	16		<b>132</b>
<b>5</b>	Foreign language communication	20	20	20	20	20	20		<b>120</b>
<b>6</b>	Economics and Business Management	24	24	24	24	24	24		<b>144</b>
<b>7</b>	Consideration of scientific laws	40	20	20					<b>80</b>
<b>Total hours per half year</b>		<b>410</b>	<b>390</b>	<b>350</b>	<b>290</b>	<b>386</b>	<b>346</b>		<b>2132</b>

Weeks per half year	12	11	10	8	11	10	<b>59</b>
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# German examination regulations

## Profession: Motor vehicle mechatronics technician

# **Examination regulations for the training occupation of automotive mechatronics engineer/automotive mechatronics technician<sup>1</sup>**

from 04th June 2013

## **§ 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,
7. conducting investigations on vehicles in accordance with legal requirements,
8. removal, conversion and retrofitting of vehicles.

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

1. Vocational training, labor, 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.

(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.

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

#### **§ 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:
  1. The candidate should demonstrate that he/she can,
    - a. plan the work steps, to research data, to analyze circuit diagrams and functions,
    - b. to select work equipment and measuring devices, to carry out measurements, to document results,
    - c. maintenance requirements, in particular, the connection between technology, work organization, environmental protection as well as safety and health protection,
    - d. 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;
  2. The test object should be connected to at least one of the following systems
    - a. Electrical system,
    - b. Lighting System,
    - c. Charging current system,
    - d. Starting system or
    - e. Brake mechanismPerforming 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;
  3. 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;
  4. 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;
  5. 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:
  - a. Inspection of vehicles or vehicle systems according to manufacturer's specifications or road traffic regulations;
  - b. 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;
  - c. 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.

No.	Skills, knowledge, and ability	to be taught as part of the apprenticeship profile	Timed guideline values in weeks	
			1st to 18th Month	19th to 36th month
1	2	3	4	
1	Operation of vehicles and systems (§2 para. 3 No. 1)	a) Observe and apply regulations and instructions for safety and operation b) Use and explain operating instructions c) Handle controls of vehicles, equipment, and systems as well as their protective devices d) Use menu functions and operate information, communication, comfort, and safety systems	5	
2	Decommissioning the machine and put into operation from vehicle technical systems (§ 2, paragraph 3, point 2)	a) manufacturer-specific instructions, Safety regulations and protective measures, in particular standards and regulations for electrotechnical work on high-voltage vehicles as well as accident prevention regulations and rules of technology (b) increased risk potential for vehicle detection c) Observe safety regulations for high-voltage systems and secure the working area d) Disconnect the systems from the power supply in accordance with the operating instructions and secure them against being switched on again, and determine that they are free from voltage e) Check functions and document results f) assess and analyse electrical hazards	3	
		g) put vehicle-technical systems in a work-safe maintenance and repair condition, especially their explosive substances, Note fuels, gases, liquids and electrical		2

		voltages		
		Vehicle technical systems, especially air conditioning systems, electrical systems, compressed air systems, hydraulic systems and pyrotechnic systems, according to manufacturer's instructions except and put into operation, check functions and document results		4
3	measurement and testing systems (§ 2, paragraph 3, point 3)	<p>a) Determine target data, select measuring methods, and instruments</p> <p>(b) Apply protective measures against electric flow through the body and arcing faults</p> <p>c) Acquire measured values and compare them with target data, in particular, electrical and electronic quantities and signals on components, assemblies, and Measure, testing and assess systems</p> <p>d) visually check electrical connections, lines and line connections for mechanical damage</p> <p>e) Check function of electrical components, lines, and fuses</p> <p>f) Select and use measuring equipment for measuring and checking lengths, angles, and surfaces</p> <p>g) Measure lengths, especially with calipers, micrometers and dial indicators, Check compliance with tolerances and fits</p> <p>h) Check workpieces with angles, limit gauges, and thread gauges</p> <p>i) measure and test physical quantities, in particular pressures and temperatures</p> <p>j) Document test results</p>	5	
		k) Check and evaluate the function of protective and equipotential bonding conductors l) Measure and evaluate insulation resistance		2
4	Execution of service and maintenance	a) Apply work and safety regulations as well as manufacturer	14	

	<p>(§ 2, paragraph 3, point 4)</p>	<p>guidelines during transport and lifting</p> <p>b) Moving, parking, lifting, supporting and securing vehicles, assemblies, and systems</p> <p>c) Perform maintenance work according to specifications, in particular check operating fluids, refill, change and contribute to disposal</p> <p>d) Check mechanical and electrical components, assemblies and systems for wear, damage, leaks, positional deviations and functionality</p> <p>e) Use circuit diagrams and function diagrams, check hydraulic, pneumatic and electrical lines, connections and mechanical connections</p> <p>f) Measure and adjust pressures on pneumatic and hydraulic systems</p> <p>g) Apply maintenance and testing instructions and carry out maintenance work</p> <p>h) Carry out function checks and read out fault memory</p> <p>i) Document work steps as well as test and measurement results</p>		
		<p>j) Make adjustments to vehicles and systems</p> <p>k) Create and interpret test and measurement protocols</p>		4
5	<p>Diagnosing of errors and malfunctions in vehicles and systems (§ 2, paragraph 3, point 5)</p>	<p>a) Recognize customer complaints, carry out a functional check and define diagnostic methods</p> <p>b) Damage and malfunctions to mechanical, electrical, electronic components, mechatronic, pneumatic, hydraulic and networked vehicle systems and their components</p> <p>c) Determine errors and their causes with the help of circuit diagrams and function diagrams</p> <p>d) Create test reports and document results</p> <p>e) Check, evaluate and parameterize onboard electrical system, charging current, start and lighting systems and document</p>	8	

		<p>results according to customer requirements</p> <p>f) Take measures to avoid hazards due to insulation faults</p> <p>g) Detect data communication between control units</p>		
		<p>h) Determine system states with the help of diagnostic systems, compare with information in databases and evaluate the result</p> <p>i) Use troubleshooting programs, manufacturer information as well as databases and use the hotline and telediagnosics</p> <p>j) Detect and update ECU software, make provisions and adjustments to vehicle systems and adjust learning values</p> <p>k) Determine diagnosis and repair options depending on the customer order</p> <p>l) Check, assess and parameterize comfort, safety and driver assistance systems according to customer requirements, documenting results</p>		6
		<p>a) Determine diagnosis and repair options</p> <p>b) Determine causes of malfunctions in drive, chassis, comfort and safety systems with the aid of diagnostic systems</p> <p>c) Carry out wheel alignment and generate a measurement report</p> <p>d) Check and evaluate brake, chassis, suspension, damping and level control systems</p> <p>e) Check and diagnose drive units including engine management system, exhaust system, and ancillaries</p> <p>f) Check and evaluate body systems, in particular, locking systems, convertible top systems and transmissions</p> <p>g) perform a functional analysis of air conditioning systems and networked vehicle components, in particular driver assistance systems and active safety systems</p>		30

		<p>h) Record and evaluate data communication between control units</p> <p>i) Locate faults on wireless signal transmission systems</p> <p>j) Test and evaluate power transmission systems, in particular, manual transmissions and automatic transmissions</p> <p>k) Check and diagnose steering systems</p> <p>l) use expert systems, in particular, guided troubleshooting, database and telediagnosis, using the hotline</p>		
6	<p>Dismantling, repairing and assembling components, Assemblies and systems (§ 2, paragraph 3, point 6)</p>	<p>a) Decommission, dismantle, disassemble components, assemblies, and systems, identify substances that are hazardous to safety and health, check for reusability, label and systematically store them</p> <p>b) Assign dismantled components and assemblies to systems and check them for completeness</p> <p>c) Cleaning, preserving and storing components and assemblies</p> <p>d) add components, assemblies, and systems, in particular, produce screw under consideration of the partial sequence and the torque</p> <p>e) Assemble components, assemblies, and systems, commission them and check their function and form accuracy</p> <p>f) Prepare surfaces for corrosion protection, add corrosion protection and renew</p> <p>g) Check the position of components and assemblies, measure positional deviations</p> <p>h) Mark and circle reference lines, bore centers and outlines, taking into account the material properties, and separating and forming components and semi-finished products</p>	18	

		<p>i) Determine and set machine values of hand-held and stationary machines; drill and lower workpieces and components</p> <p>j) Make internal and external threads and repair</p> <p>k) Establish, check, repair and document electrical connections and connections</p> <p>l) repair wear-prone assemblies and systems, especially brakes</p> <p>m) Fit tires and balance wheels</p>		
		<p>n) Derive repair measures after diagnosis, Implement repair procedures</p> <p>o) Install and connect electrical systems, check their operation and ensure safety</p> <p>p) repair electronic, mechatronic, pneumatic and hydraulic systems, assemblies and components</p> <p>q) observe electro-technical safety rules when working on electrical systems, in particular on high-voltage systems and fuel cells</p>		6
		<p>a) Replace high-voltage components</p> <p>b) repair electrical and optoelectronic data communication cables</p> <p>c) Repair drive units including engine management system, exhaust system, and ancillaries</p> <p>d) Repair power transmission systems, in particular, manual transmissions, automatic transmissions and four-wheel drive systems</p> <p>e) Repair bodywork systems, especially locking systems, roof systems and sunroofs</p> <p>(f) repairing chassis, suspension, damping and level control systems</p>		14
7	<p>Performing Investigations on vehicles according to legal requirements (§ 2, paragraph 3, point 7)</p>	<p>(a) Prepare vehicles for statutory tests</p> <p>b) Check traffic and operational safety of motor vehicles, document deficiencies and initiate measures for their elimination</p> <p>c) Determine target and actual values using the diagnostic</p>		6

		systems, record-setting values, make adjustments and document results		
8	Removal, conversion and retrofitting of vehicles (§ 2, paragraph 3, point 8)	a) Determine wheels, chassis and body components vehicle-related	2	
		b) Assign, remodel and convert accessories, additional equipment, and special equipment according to legal regulations and technical documentation to the vehicle type, check function as well as document changes c) Integrate components and systems into the vehicle network d) Coding and parameterizing control units, updating software versions, documenting changes e) instruct customers in operation and draw attention to licensing regulations		4
		a) Retrofit systems, components, and circuits of signal processing for optical transmission systems b) Retrofit motor vehicles with wireless signal transmission systems, antenna systems, and entertainment electronics		4

No.	Skills, knowledge, and ability	to be conveyed in the vocational training model	Time values in weeks	
			1st to 18th Month	19th to 36th Month
1	2	3	4	
1	Vocational training, labor and collective bargaining (Article 2, paragraph 4, point 1)	a) The significance of the training contract, in particular, completion, duration, and termination, explaining (b) specify mutual rights and obligations under the training contract c) Name opportunities for vocational training d) Name significant parts of the employment contract (e) Identify key provisions of collective agreements applicable to the training enterprise	to be arranged throughout the training	

2	Construction and organization of the training company (Article 2, paragraph 4, point 2)	<ul style="list-style-type: none"> <li>a) Explain the structure and tasks of the training company</li> <li>b) Basic functions of the training company such as procurement, manufacturing, sales, and administration</li> <li>c) Name the relationships of the training company and its employees with business organizations, professional bodies and trade union</li> <li>d) Describe the fundamentals, tasks and working methods of the company constitution or personnel representation organs of the training company</li> </ul>		
3	Safety and health at work (Article 2, paragraph 4, point 3)	<ul style="list-style-type: none"> <li>a) Identify occupational health and safety and take precautions to prevent it</li> <li>(b) apply occupational health and safety and accident prevention regulations</li> <li>c) Describe accident behavior and initiate initial action</li> <li>d) apply preventive fire protection regulations; Describe fire behaviors and take fire-fighting measures</li> </ul>		
4	Environmental protection (§ 2, paragraph 4, point 4)	<p>Contribute to avoiding operational environmental pollution in the occupational sphere of influence, in particular</p> <ul style="list-style-type: none"> <li>a) Explain possible environmental impacts of the training company and its contribution to environmental protection using examples</li> <li>b) apply environmental protection regulations applicable to the training company</li> <li>c) use opportunities for economical and environmentally friendly use of energy and materials</li> <li>d) Avoid waste; dispose of substances and materials in an environmentally friendly manner</li> </ul>	to be arranged throughout the training	
5	Plan and prepare work processes as well as the control and	<ul style="list-style-type: none"> <li>a) Planning and defining work steps and processes</li> <li>b) Determine materials, equipment, and auxiliary materials</li> </ul>	6	



	evaluation of work results (§ 2, paragraph 4, point 5)	<p>c) Request, provide and document parts, material,</p> <p>d) Determine time requirements</p> <p>e) Prepare the workplace taking the work order into account</p> <p>f) Checking, evaluating, documenting and proposing measures to improve the results of work by means of target/actual value comparisons</p> <p>g) Observe the safety instructions of the manufacturers, especially for motor vehicles with alternative drives</p>		
		<p>h) Prepare vehicle transfer</p> <p>i) Plan, control and evaluate work processes, taking into account the work order, the maintenance specifications, the installation instructions, the personnel and technical conditions</p> <p>j) Determining test equipment and coordinate its use</p> <p>k) detect, record and initiate measures for their disposal on adjacent components and assemblies</p> <p>l) Plan work in a team, divide tasks and evaluate results of cooperation</p>		8
6	Operational and technical communication (§ 2, paragraph 4, point 6)	<p>a) apply a business information system to process work orders and use it to procure technical documentation and information</p> <p>b) conduct discussions in accordance with the situation, present facts and apply English diagrams</p> <p>c) ensure communication with customers as well as with preceding and following functional areas</p> <p>d) handle data carriers and observe data protection; read digital and analog measurement and test data</p> <p>(e) identify vehicles, systems, components, and assemblies</p> <p>f) Read and apply drawings, make sketches</p> <p>g) Read and apply repair, installation, commissioning and</p>	11	

		operating instructions, catalogs, tables and diagrams h) interpret, process, convey and present technical information		
		i) read and apply wiring diagrams, circuit diagrams, wiring diagrams, layout diagrams and function diagrams j) Read and observe the function diagrams of vehicle-pneumatic and hydraulic controls and power transmissions k) apply road safety and traffic regulations and guidelines l) Accept customer requests and information, forward it during operation and consider it according to specifications m) Observe specifications for informing about maintenance work n) Observe the instructions for informing about the operation of the accessories and ancillary equipment, and refer to safety rules and regulations o) Use, deploy and apply knowledge databases p) Take service information also from English-language documents and apply q) Observe guidelines for warranty, goodwill, and material defect liability (r) update operational information systems and technical equipment s) Carry out fault and damage analysis using a restrictive customer survey t) customers for repair and maintenance work as well as other services u) Determine and evaluate customer and supplier requirements and initiate measures for fulfillment		8

7	<p>Performing quality assurance measures (§ 2, paragraph 4, point 7)</p>	<p>a) Apply test methods and test equipment according to requirements  b) Systematically search for causes of defects and quality defects, contribute to elimination, document work  c) Apply the company's quality management system  d) Observe inspection and maintenance periods for operating and testing equipment and initiate measures  e) Observe and apply procedures for recall actions or rework</p>	6	
		<p>f) contribute to the continuous improvement of work processes in one's work area  g) systematically seek, assess, eliminate and document the causes of errors and deficiencies in the work process as well as estimate the consequential effects of errors and deficiencies  h) review, evaluate and record own and other work results</p>		6

# Polish curriculum for training “Motor vehicle mechanic”



# POLSKA RAMA KWALIFIKACJI

WIEDZA  
UMIĘTNOŚCI  
KOMPETENCJE SPOŁECZNE





# POLSKA RAMA KWALIFIKACJI

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*Egzemplarz bezpłatny*

# Wprowadzenie

Modernizacja polskich kwalifikacji rozpoczęta uchwaleniem ustawy z 22 grudnia 2015 r. o Zintegrowanym Systemie Kwalifikacji (Dz.U. 2016 poz. 64) polega na przyjęciu wspólnych zasad dotyczących kwalifikacji funkcjonujących w różnych obszarach. Na zintegrowany system składają się z jednej strony te elementy, które funkcjonują już w polskim życiu społecznym i gospodarczym, a z drugiej strony nowe instrumenty umożliwiające efektywną integrację całego systemu, z których najważniejsze to Polska Rama Kwalifikacji (PRK) i Zintegrowany Rejestr Kwalifikacji (ZRK), w którym są wszystkie kwalifikacje włączone do zintegrowanego systemu. Wszystkie kwalifikacje włączone do zintegrowanego systemu mają także przypisany poziom Polskiej Ramy Kwalifikacji (poziom PRK).

Prace nad Polską Ramą Kwalifikacji rozpoczęły się w 2008 r. wraz z realizacją projektu „Opracowanie bilansu kwalifikacji i kompetencji dostępnych na rynku pracy w Polsce oraz modelu Krajowych Ram Kwalifikacji”, stanowiącego pierwszy etap prac nad systemem kwalifikacji w Polsce. Ekspertki pracujący w projekcie zaproponowali pierwsze zapisy charakterystyk poziomów kwalifikacji, obejmujących zapisy uniwersalne, ale również zapisy PRK dotyczące edukacji ogólnej, wyższej oraz zawodowej. Eksperska propozycja PRK zawierała 7 poziomów, tj. pierwotnie nie została przedstawiona propozycja poziomu piątego. Propozycja ta zakładała dwustopniową konstrukcję PRK.

W ramach kolejnego etapu prac ekspercka propozycja, rozbudowana do ośmiopoziomowej struktury została poddana weryfikacji, zarówno przez ekspertów, jak i przez partnerów społecznych w ramach zainicjowanej w lutym 2011 r. debaty dotyczącej Polskiej Ramy Kwalifikacji. W trakcie dyskusji w grupach tematycznych dyskutowano m.in. o:

- terminologii oraz zapewnieniu spójności języka, jakim opisywane są elementy systemu kwalifikacji,
- zagadnieniach związanych ze strukturą PRK,
- sposobie opisywania poziomów kwalifikacji PRK,
- zapisach poszczególnych składników opisu poziomów kwalifikacji.

Uwagi i zastrzeżenia zgłaszane w trakcie tych dyskusji przyczyniły się znacząco do kształtu Polskiej Ramy Kwalifikacji. Były one przedmiotem dalszych prac eksperckich prowadzonych w Instytucie Badań Edukacyjnych. Brali w nich udział: dr Agnieszka Chłoń-Domińczak, prof. Ewa Chmielecka, prof. Andrzej Kraśniewski, dr Stanisław Sławiński, przy wsparciu asystenckim Moniki Parys. Ponadto, efekty prac konsultowali Horacy Dębowski, prof. Zbigniew Marciniak, dr Tomasz Saryusz-Wolski, Wojciech Stęchły, Katarzyna Trawińska-Konador, Agnieszka Szymczak oraz dr Gabriela Ziewiec. Opisy charakterystyk poziomów typowych dla kształcenia i szkolenia zawodowego były opracowane z wykorzystaniem inspiracji zawartych w ekspertyzie dr Krystyny Lelińskiej oraz Macieja Gruzy.

Opracowana w połowie 2012 r. wersja charakterystyk poziomów była poddana weryfikacji w ramach prac grup roboczych zajmujących się przypisywaniem poziomów PRK do kwalifikacji (w latach 2012–2013), a następnie w ramach prac nad sektorowymi ramami kwalifikacji (w latach 2013–2014). Zapisy PRK dotyczące edukacji ogólnej były weryfikowane przez ekspertów pracujących nad podstawą programową edukacji ogólnej.

Finalne zapisy PRK są zatem wynikiem prac prowadzonych przez wiele osób w okresie 7 lat. Tak długi czas wynikał z potrzeby wypracowania ustaleń uwzględniających specyfikę polskiego systemu kwalifikacji, a także doświadczenia przedstawicieli świata edukacji i rynku pracy, tak aby PRK mogła stanowić dobrą podstawę do identyfikacji poziomów kwalifikacji w systemie obejmującym kwalifikacje uzyskiwane zarówno w systemie edukacji formalnej, jak i pozaformalnej oraz w wyniku uczenia się nieformalnego.

Autorzy wyrażają podziękowanie wszystkim osobom i środowiskom, które wniosły wkład w tworzenie Polskiej Ramy Kwalifikacji.



# Struktura Polskiej Ramy Kwalifikacji

W PRK, podobnie jak w Europejskiej Ramie Kwalifikacji (ERK), wyróżnia się osiem poziomów kwalifikacji. Każdy z poziomów PRK został scharakteryzowany za pomocą ogólnych stwierdzeń dotyczących efektów uczenia się, wymaganych dla kwalifikacji danego poziomu. Dla określania poziomu PRK nie ma znaczenia, czy wymagane dla kwalifikacji efekty uczenia się są osiągnięte w ramach zorganizowanej edukacji czy w inny sposób.

Charakterystyki poziomów PRK odnoszą się do pełnego spektrum wymaganych dla kwalifikacji efektów uczenia się, to znaczy do wiedzy, umiejętności oraz kompetencji społecznych. Charakterystyki kolejnych poziomów PRK odzwierciedlają coraz wyższe wymagania w tych zakresach.

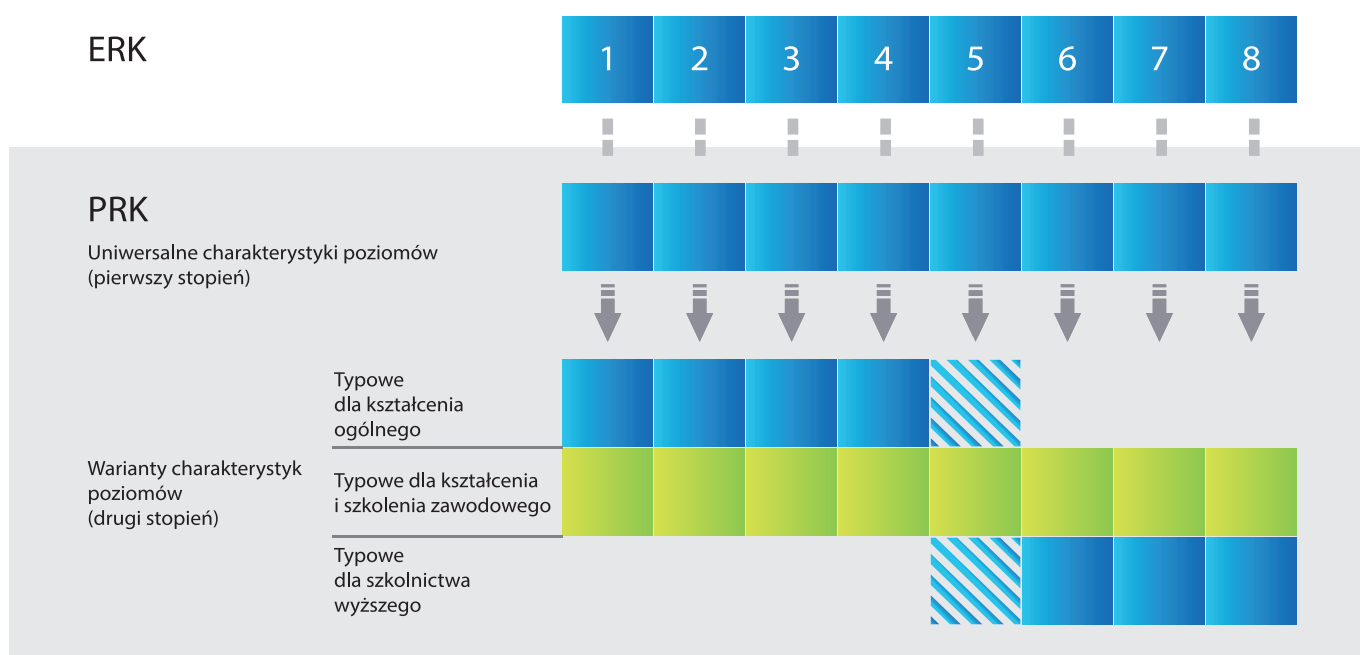
Unikatowym polskim rozwiązaniem w PRK są dwustopniowe charakterystyki poziomów. Charakterystyki poziomów pierwszego stopnia (uniwersalne) dotyczą wszystkich rodzajów edukacji. Stanowią one załącznik do ustawy o Zintegrowanym Systemie Kwalifikacji.

Są one następnie rozwijane w charakterystyki poziomów drugiego stopnia:

- charakterystyki typowe dla kwalifikacji o charakterze ogólnym, ustalone rozporządzeniem Ministra Edukacji Narodowej z dnia 13 kwietnia 2016 r.,
- charakterystykę typową dla kwalifikacji uzyskiwanych po uzyskaniu kwalifikacji pełnej na poziomie 4, ustaloną rozporządzeniem Ministra Edukacji Narodowej oraz Ministra Nauki i Szkolnictwa Wyższego z dnia 17 czerwca 2016 r.,
- charakterystyki typowe dla kwalifikacji uzyskiwanych w ramach szkolnictwa wyższego, ustalone rozporządzeniem Ministra Nauki i Szkolnictwa Wyższego z dnia 26 września 2016 r.,
- charakterystyki typowe dla kwalifikacji o charakterze zawodowym, ustalone rozporządzeniem Ministra Edukacji Narodowej z dnia 13 kwietnia 2016 r.

Charakterystyki poziomów pierwszego i drugiego stopnia należy czytać łącznie.

**Strukturę Polskiej Ramy Kwalifikacji przedstawia rysunek.**



Źródło: opracowanie własne.

# Charakterystyki I stopnia (uniwersalne) Polskiej Ramy Kwalifikacji – poziomy 1–8

Zapisy – wiedza, umiejętności, kompetencje społeczne – należy odnosić do określonej dziedziny uczenia się lub działalności zawodowej

	Kategorie opisowe i aspekty o podstawowym znaczeniu	POZIOM 1	POZIOM 2	POZIOM 3	POZIOM 4	POZIOM 5	POZIOM 6	POZIOM 7	POZIOM 8	
		ZNA I ROZUMIE:	ZNA I ROZUMIE:	ZNA I ROZUMIE:	ZNA I ROZUMIE:	ZNA I ROZUMIE:	ZNA I ROZUMIE:	ZNA I ROZUMIE:	ZNA I ROZUMIE:	
WIEDZA (W)	<b>Zakres</b> Kompletność perspektywy poznawczej Zależności	PTU_W elementarne fakty i pojęcia oraz zależności między wybranymi zjawiskami przyrodniczymi, społecznymi i w sferze wytworów ludzkiej myśli	P2U_W poszerzony zbiór elementarnych faktów, prostych pojęć oraz zależności między wybranymi zjawiskami przyrodniczymi, społecznymi i w sferze wytworów ludzkiej myśli	P3U_W podstawowe fakty i pojęcia oraz zależności między wybranymi zjawiskami przyrodniczymi, społecznymi i w sferze wytworów ludzkiej myśli, a ponadto w określonych dziedzinach w szerszym zakresie wybrane fakty, pojęcia i zależności	P4U_W poszerzony zbiór podstawowych faktów, umiarkowanie złożonych pojęć, teorii i zależności między wybranymi zjawiskami przyrodniczymi, społecznymi oraz w sferze wytworów ludzkiej myśli, a ponadto w określonych dziedzinach w szerszym zakresie fakty, umiarkowanie złożone pojęcia, teorie i zależności między nimi	P5U_W w szerokim zakresie – fakty, teorie, metody i zależności między nimi	P6U_W w zaawansowanym stopniu – fakty, teorie, metody oraz złożone zależności między nimi	P7U_W w pogłębiony sposób wybrane fakty, teorie, metody oraz złożone zależności między nimi, także w powiązaniu z innymi dziedzinami	P8U_W światowy dorobek naukowy i twórczy oraz wynikające z niego implikacje dla praktyki	WIEDZA (W)
	<b>Głębina rozumienia</b> Kompletność perspektywy poznawczej Zależności									
UMIĘJĘTNOŚCI (U)	<b>Rozwiązywanie problemów i stosowanie wiedzy w praktyce</b> Złożoność problemu Samodzielność w działaniu Innowacyjność podejścia Warunki działania	POTRAFI: wykonywać bardzo proste zadania według szczegółowych wskazówek w typowych warunkach	POTRAFI: wykonywać proste zadania według ogólnej instrukcji, najczęściej w typowych warunkach	POTRAFI: wykonywać niezbyt proste zadania według ogólnej instrukcji w częściowo zmiennych warunkach	POTRAFI: wykonywać niezbyt złożone zadania w części bez instrukcji często w zmiennych warunkach	POTRAFI: wykonywać zadania bez instrukcji w zmiennych, przewidywalnych warunkach	POTRAFI: innowacyjnie wykonywać zadania oraz rozwiązywać złożone i nietypowe problemy w zmiennych i nie w pełni przewidywalnych warunkach	POTRAFI: wykonywać zadania oraz formułować i rozwiązywać problemy, z wykorzystaniem nowej wiedzy, także z innych dziedzin	POTRAFI: dokonywać analizy i twórczej syntezy dorobku naukowego i twórczego w celu identyfikowania i rozwiązywania problemów badawczych oraz związanych z działalnością innowacyjną i twórczą; tworzyć nowe elementy tego dorobku	UMIĘJĘTNOŚCI (U)
	<b>Uczenie się</b> Samodzielność Metody	P1U_U uczyć się pod bezpośrednim kierunkiem w zorganizowanej formie	P2U_U uczyć się pod kierunkiem w zorganizowanej formie	P3U_U uczyć się w części samodzielnie pod kierunkiem w zorganizowanej formie	P4U_U uczyć się samodzielnie w zorganizowanej formie	P5U_U uczyć się samodzielnie	P6U_U samodzielnie planować własne uczenie się przez całe życie	P7U_U samodzielnie planować własne uczenie się przez całe życie i ukierunkowywać innych w tym zakresie	P8U_U samodzielnie planować własny rozwój oraz inspirować rozwój innych osób	
	<b>Komunikowanie się</b> Zakres wypowiedzi Złożoność wypowiedzi	odbierać proste wypowiedzi, tworzyć bardzo proste wypowiedzi	odbierać niezbyt proste wypowiedzi, tworzyć proste wypowiedzi	odbierać niezbyt złożone wypowiedzi, tworzyć niezbyt proste wypowiedzi	odbierać złożone wypowiedzi, tworzyć niezbyt proste wypowiedzi dotyczące szerokiego zakresu zagadnień	odbierać i formułować proste wypowiedzi w języku obcym	odbierać niezbyt złożone wypowiedzi, tworzyć proste wypowiedzi z użyciem specjalistycznej terminologii	komunikować się z otoczeniem, uzasadniać swoje stanowisko	komunikować się ze zróżnicowanymi kręgami odbiorców, odpowiednio uzasadniać stanowiska	
KOMPETENCJE SPOŁECZNE (K)	<b>Tożsamość</b> Uczestniczenie Poczucie odpowiedzialności Postępowanie	JEST GOTÓW DO: respektowania zobowiązań wynikających z przynależności do różnych wspólnot	JEST GOTÓW DO: podejmowania obowiązków wynikających z przynależności do różnych wspólnot	JEST GOTÓW DO: przynależenia do wspólnot różnego rodzaju, funkcjonowania w różnych rolach społecznych oraz podejmowania podstawowych powinności z tego wynikających	JEST GOTÓW DO: przyjmowania odpowiedzialności związanej z uczestnictwem w różnych wspólnotach i funkcjonowaniem w różnych rolach społecznych	JEST GOTÓW DO: podejmowania podstawowych obowiązków zawodowych i społecznych, ich oceniania i interpretacji	JEST GOTÓW DO: kultywowania i upowszechniania wzorów właściwego postępowania w środowisku pracy i poza nim	JEST GOTÓW DO: tworzenia i rozwijania wzorów właściwego postępowania w środowisku pracy i życia	JEST GOTÓW DO: niezależnego badania powiększającego istniejący dorobek naukowy i twórczy; podejmowania wyzwań w sferze zawodowej i publicznej z uwzględnieniem: • ich etycznego wymiaru, • odpowiedzialności za ich skutki oraz kształtowania wzorów właściwego postępowania w takich sytuacjach	KOMPETENCJE SPOŁECZNE (K)
	<b>Współpraca</b> Praca zespołowa Warunki działania Przywództwo	P1U_K działania i współdziałania pod bezpośrednim nadzorem w zorganizowanych warunkach	P2U_K działania i współdziałania pod kierunkiem w zorganizowanych warunkach	P3U_K częściowo samodzielnego działania oraz współdziałania w zorganizowanych warunkach	P4U_K autonomicznego działania i współdziałania w zorganizowanych warunkach	P5U_K samodzielnego działania oraz współdziałania z innymi w zorganizowanych warunkach, kierowania niedużym zespołem w zorganizowanych warunkach	P6U_K samodzielnego podejmowania decyzji, krytycznej oceny działań własnych, działań zespołów, którymi kieruje, i organizacji, w których uczestniczy; przyjmowania odpowiedzialności za skutki tych działań	P7U_K podejmowania inicjatyw, krytycznej oceny siebie oraz zespołów i organizacji, w których uczestniczy; przewodzenia grupie i ponoszenia odpowiedzialności za nią		
	<b>Odpowiedzialność</b> Konsekwencje działań własnych Konsekwencje działań zespołu Ocena	oceniania swoich działań i przyjmowania odpowiedzialności za bezpośrednie ich skutki	oceniania działań, w których uczestniczy, i przyjmowania odpowiedzialności za ich skutki	oceniania działań swoich i zespołowych; podejmowania odpowiedzialności za skutki tych działań	oceniania działań swoich i osób, którymi kieruje; przyjmowania odpowiedzialności za skutki działań własnych oraz tych osób	oceniania działań swoich i osób oraz zespołów, którymi kieruje; przyjmowania odpowiedzialności za skutki tych działań				

## Charakterystyki I stopnia (uniwersalne) Polskiej Ramy Kwalifikacji – poziomy 1–8

Zapisy – wiedza, umiejętności, kompetencje społeczne – należy odnosić do określonej dziedziny uczenia się lub działalności zawodowej



# Charakterystyki II stopnia Polskiej Ramy Kwalifikacji typowe dla kwalifikacji o charakterze ogólnym – poziomy 1–4

## Zapisy – wiedza, umiejętności, kompetencje społeczne – należy odnosić do uczenia się w określonym zakresie wykształcenia ogólnego

■ odpowiednio do specyfikacji poszczególnych kwalifikacji zapis odnosi się także do kolejnych poziomów PRK

	Kategorie opisowe	Aspekty o podstawowym znaczeniu	POZIOM 1		POZIOM 2		POZIOM 3		POZIOM 4		
			ZNA I ROZUMIE:		ZNA I ROZUMIE:		ZNA I ROZUMIE:		ZNA I ROZUMIE:		
<b>WIEDZA (W)</b>	<b>Język i komunikowanie się</b>	<b>Struktury i zasady tworzenia wypowiedzi</b>	P10_WJ	struktury bardzo prostych wypowiedzi i zasady ich tworzenia	P20_WJ	struktury prostych wypowiedzi i zasady ich tworzenia	P30_WJ	struktury niezbyt złożonych wypowiedzi i zasady ich tworzenia	P40_WJ	struktury umiarkowanie złożonych wypowiedzi i zasady ich tworzenia	<b>WIEDZA (W)</b>
	<b>Matematyka i nauki przyrodnicze</b>	<b>Pojęcia i zależności</b>	P10_WM	wybrane bardzo proste pojęcia i zależności matematyczne	P20_WM	wybrane proste pojęcia, zależności i strategie matematyczne oraz bardzo proste rozumowania matematyczne	P30_WM	wybrane niezbyt złożone pojęcia, zależności i strategie matematyczne oraz proste rozumowania i modele matematyczne	P40_WM	wybrane umiarkowanie złożone pojęcia, zależności i strategie matematyczne oraz niezbyt złożone rozumowania i modele matematyczne	
		<b>Interpretacje</b>	P10_WM	bardzo prosty opis otaczającego świata materialnego oraz wybranych zjawisk i procesów w przyrodzie i w technice	P20_WM	prosty opis wybranych elementów składowych świata materialnego oraz wybranych zjawisk i procesów w przyrodzie i w technice	P30_WM	niezbyt złożony opis wybranych elementów składowych świata materialnego oraz wybranych zjawisk i procesów w przyrodzie i w technice	P40_WM	umiarkowanie złożony opis wybranych elementów składowych świata materialnego oraz wybranych zjawisk i procesów w przyrodzie i w technice	
	<b>Funkcjonowanie społeczne</b>	<b>Zasady funkcjonowania</b>	P10_WF	zasady funkcjonowania w różnych grupach społecznych	P20_WF	podstawowe zasady ładu społecznego	P30_WF	prawne podstawy ładu w sferze działalności gospodarczej, społecznej i politycznej oraz w życiu rodzinnym	P40_WF	wybrane teorie dotyczące życia społecznego i jego rozwoju	
<b>Role społeczne</b>		P10_WF	podstawowe role społeczne człowieka we współczesnym społeczeństwie	P20_WF	podstawowe procedury demokracji	P30_WF	podstawowe zasady funkcjonowania w miejscu nauki, pracy oraz uczestnictwa w życiu publicznym ■	P40_WF	podstawowe mechanizmy funkcjonowania gospodarki, także w wymiarze globalnym		
<b>Tożsamość</b>		P10_WF	elementarne wyznaczniki własnej tożsamości kulturowej	P20_WF	podstawowe obowiązki współczesnego człowieka wobec rodziny, społeczności lokalnej i państwa	P30_WF	najważniejsze elementy dziedzictwa narodowego oraz humanistycznego dziedzictwa Europy i świata	P40_WF	w pogłębiony sposób własną tożsamość wynikającą z dziedzictwa historii i kultury swojego narodu oraz z uczestnictwa w różnego rodzaju wspólnotach		
			P10_WF	elementarne wyróżniki wspólnot, do których należy	P20_WF	podstawowe fakty z historii swojego kraju i regionu	P30_WF	podstawowe zasady funkcjonowania wspólnot, do których należy, wynikające z wartości, do których te wspólnoty się odwołują			
<b>UMIĘTNOŚCI (U)</b>	<b>Język i komunikowanie się</b>	<b>Odbieranie i tworzenie wypowiedzi</b>	P10_UJ	odbierać ze zrozumieniem proste wypowiedzi dotyczące typowych zagadnień i sytuacji	P20_UJ	odbierać ze zrozumieniem niezbyt złożone wypowiedzi	P30_UJ	odbierać ze zrozumieniem umiarkowanie złożone wypowiedzi	P40_UJ	odbierać ze zrozumieniem złożone wypowiedzi	<b>UMIĘTNOŚCI (U)</b>
		<b>Postępowanie się językiem obcym</b>	P10_UJ	tworzyć bardzo proste wypowiedzi dotyczące typowych zagadnień i sytuacji	P20_UJ	tworzyć i przedstawiać proste wypowiedzi	P30_UJ	tworzyć i przedstawiać niezbyt złożone wypowiedzi	P40_UJ	tworzyć i przedstawiać umiarkowanie złożone wypowiedzi	
	<b>Matematyka i nauki przyrodnicze</b>	<b>Korzystanie z narzędzi, prowadzenie obserwacji i doświadczeń</b>	P10_UM	korzystać z bardzo prostych narzędzi matematycznych w typowych sytuacjach życia codziennego	P20_UM	korzystać z prostych narzędzi matematycznych w różnych sytuacjach	P30_UM	korzystać z niezbyt złożonych narzędzi matematycznych	P40_UM	korzystać z umiarkowanie złożonych narzędzi matematycznych	
			P10_UM	przewodzić bardzo proste pomiary, obserwacje i doświadczenia dotyczące obiektów, zjawisk i procesów w przyrodzie i w technice	P20_UM	przewodzić proste pomiary, obserwacje i doświadczenia dotyczące obiektów, zjawisk i procesów w przyrodzie i w technice	P30_UM	przewodzić niezbyt złożone pomiary, obserwacje i doświadczenia dotyczące obiektów, zjawisk i procesów w przyrodzie i w technice	P40_UM	przewodzić umiarkowanie złożone pomiary, obserwacje i doświadczenia w zakresie nauk przyrodniczych	
	<b>Funkcjonowanie społeczne</b>	<b>Wyrażanie przynależności do wspólnot</b>	P10_UF	w typowych sytuacjach dawać świadectwo przynależności do określonej wspólnoty	P20_UF	w typowych sytuacjach zachowywać się odpowiednio do zwyczajów przyjętych we wspólnotach, do których należy	P30_UF	odpowiednio do sytuacji włączać się do działania określonej wspólnoty ■	P40_UF		
<b>Uczenie się</b>	<b>Organizacja</b>	P10_UU	uczyć się według otrzymanych wskazówek, bez stałego nadzoru osoby ukierunkowującej	P20_UU	indywidualnie uczyć się według otrzymanych wskazówek, bez nadzoru osoby ukierunkowującej	P30_UU	uczyć się samodzielnie według określonego planu	P40_UU	planować własne uczenie się odpowiednio do swojego zaawansowania w realizowanym programie kształcenia z uwzględnieniem perspektyw własnego rozwoju		
	<b>Planowanie</b>	P10_UU	uzasadnić potrzebę uczenia się	P20_UU	uczestniczyć w podejmowaniu decyzji dotyczących dalszego uczenia się	P30_UU	dokonywać wyborów dotyczących dalszego uczenia się z uwzględnieniem podstawowych czynników wpływających na powodzenie życiowe oraz karierę zawodową	P40_UU	dokonywać wyborów dotyczących dalszego uczenia się z uwzględnieniem perspektyw własnego rozwoju		
<b>KOMPETENCJE SPOŁECZNE (K)</b>	<b>Język i komunikowanie się</b>	<b>Kultura komunikowania się</b>	P10_KJ	przestrzegania elementarnych zasad komunikowania się w typowych sytuacjach	P20_KJ	dzielenia się posiadanymi informacjami w sytuacji, gdy jest to potrzebne	P30_KJ	przestrzegania zasad etyki oraz etykiety komunikowania się	P40_KJ	kształtowania właściwej kultury komunikowania się w różnych kontekstach	
			P10_KZ	powstrzymywania się od kłamstwa	P20_KZ	powstrzymywania się od wypowiadania niezasadnionych opinii	P30_KZ	przestrzegania zasad dbałości o zdrowie i bezpieczeństwo własne i innych w różnych kontekstach ■	P40_KZ		
	<b>Zdrowie i środowisko</b>	<b>Dbłość o zdrowie i bezpieczeństwo</b>	P10_KZ	przestrzegania podstawowych zasad higieny i bezpieczeństwa	P20_KZ	przestrzegania podstawowych zasad dbałości o zdrowie i bezpieczeństwo własne i innych	P30_KZ	przestrzegania zasad dbałości o zdrowie i bezpieczeństwo własne i innych w różnych kontekstach ■	P40_KZ		
			P10_KZ	szanowania otoczenia przyrodniczego	P20_KZ	respektowania podstawowych zasad ochrony środowiska	P30_KZ	reagowania w przypadkach wystąpienia zagrożenia dla środowiska ■	P40_KZ		
<b>Funkcjonowanie społeczne</b>	<b>Współdziałanie</b>	P10_KF	współdziałania z drugą osobą w typowych sytuacjach codziennych	P20_KF	współdziałania w ramach grupy nieformalnej z poszanowaniem reguł demokratycznych	P30_KF	współdziałania w ramach grupy zorganizowanej z poszanowaniem jej porządku hierarchicznego	P40_KF	partnerskiego dialogu i współdziałania oraz podporządkowywania się i przewodzenia w różnych strukturach hierarchicznych, z uwzględnieniem aspektów etycznych		
		<b>Angażowanie się</b>	P10_KF	aktywnego uczestnictwa w grupie działającej pod przewodnictwem osoby nadzorującej	P20_KF	rozwiązywania prostych problemów we współdziałaniu w ramach grupy nieformalnej w typowych sytuacjach	P30_KF	rozwiązywania niezbyt złożonych problemów we współdziałaniu w ramach grupy			
			P10_KF	dostrzegania potrzeb innych członków grupy i reagowania na nie	P20_KF	angażowania się w działanie na rzecz dobra wspólnego w społecznościach, których jest członkiem	P30_KF	angażowania się w sprawy publiczne w stopniu odpowiednim do pełnionych ról społecznych			
	<b>Podejmowanie obowiązków</b>	P10_KF	zachowywania się odpowiednio do zwyczajów przyjętych we wspólnotach, do których należy	P20_KF	występowania w obronie dobrego imienia wspólnot, do których należy oraz do poszanowania innych wspólnot	P30_KF	podejmowania podstawowych obowiązków, które wiążą się z przynależnością do wspólnoty				

## Charakterystyki II stopnia Polskiej Ramy Kwalifikacji typowe dla kwalifikacji o charakterze ogólnym – poziomy 1–4

Zapisy – wiedza, umiejętności, kompetencje społeczne – należy  
odnosić do uczenia się w określonym zakresie wykształcenia ogólnego





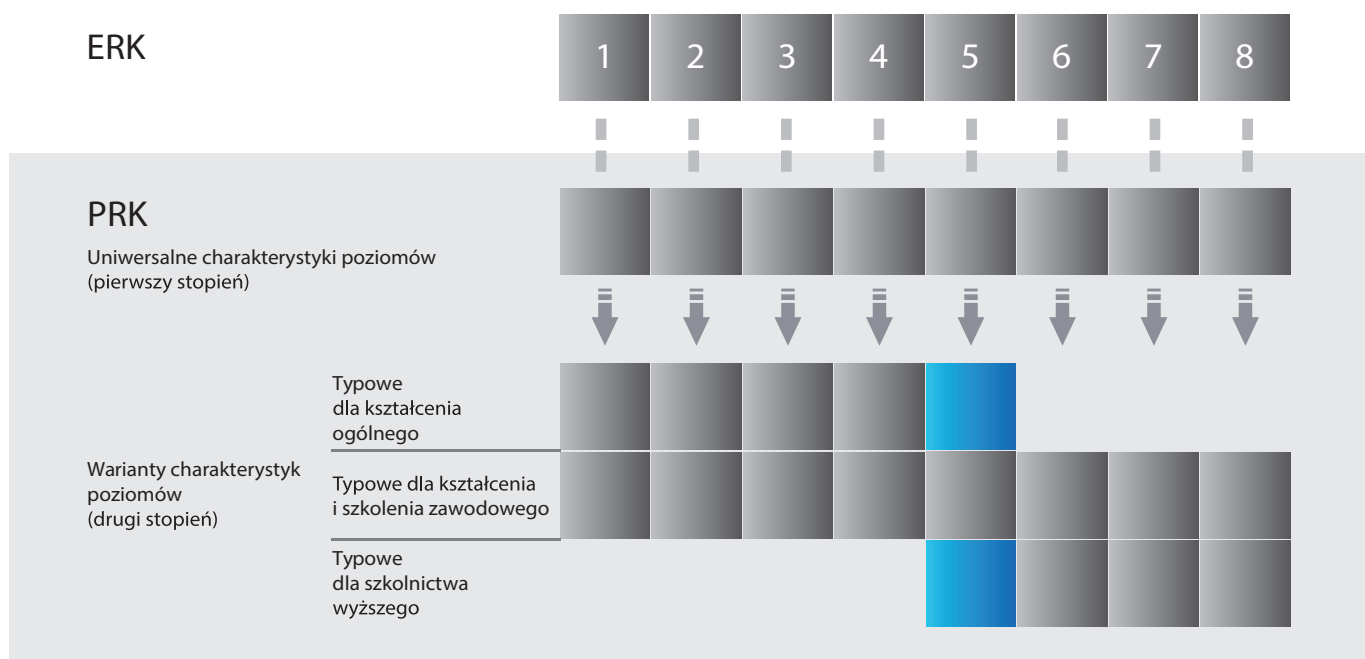
# Charakterystyka II stopnia Polskiej Ramy Kwalifikacji typowa dla kwalifikacji uzyskiwanych po uzyskaniu kwalifikacji pełnej na poziomie 4 – poziom 5

Zapisy – wiedza, umiejętności, kompetencje społeczne – należy odnosić do uczenia się w określonym zakresie wykształcenia ogólnego lub wyższego

	Kategorie opisowe	Aspekty o podstawowym znaczeniu	POZIOM 5	
			ZNA I ROZUMIE:	
<b>WIEDZA (W)</b>	Zakres i głębia	Kompletność perspektywy poznawczej, zależności	P55_WZ	<p>wybrane fakty, obiekty i zjawiska oraz dotyczące ich metody i teorie wyjaśniające złożone zależności między nimi z zakresu podstawowej wiedzy ogólnej tworzącej podstawy teoretyczne oraz wybrane zagadnienia z zakresu wiedzy szczegółowej – właściwe dla programu kształcenia</p> <p>w zaawansowanym stopniu – wybrane fakty, obiekty i zjawiska oraz dotyczące ich metody i teorie wyjaśniające złożone zależności między nimi, stanowiące podstawową wiedzę ogólną z zakresu dyscyplin naukowych tworzących podstawy teoretyczne oraz wybrane zagadnienia z zakresu wiedzy szczegółowej – właściwe dla programu kształcenia</p>
	Kontekst	Uwarunkowania, skutki	P55_WK	podstawowe ekonomiczne, prawne i inne skutki różnych rodzajów działań związanych z nadaną kwalifikacją
			<b>POTRAFI:</b>	
<b>UMIĘJŹNOŚCI (U)</b>	Wykorzystanie wiedzy	Rozwiązywanie problemów	P55_UW	wykorzystywać posiadaną wiedzę – rozwiązywać umiarkowanie złożone i nietypowe problemy i wykonywać zadania w zmiennych i nie w pełni przewidywalnych warunkach poprzez:
		Wykonywanie zadań		<ul style="list-style-type: none"> <li>właściwy dobór źródeł oraz informacji z nich pochodzących,</li> <li>dobór oraz stosowanie właściwych metod i narzędzi, w tym technik informacyjno-komunikacyjnych (ICT)</li> </ul>
	Komunikowanie się	Odbieranie i tworzenie wypowiedzi	P55_UK	komunikować się z otoczeniem z użyciem specjalistycznej terminologii – odbierać umiarkowanie złożone wypowiedzi, tworzyć niezbyt złożone wypowiedzi z użyciem specjalistycznej terminologii
		Upowszechnianie wiedzy w środowisku naukowym		przedstawiać i uzasadniać własne stanowisko
		Posługiwanie się językiem obcym		posługiwać się językiem obcym na poziomie B1+ ESOKJ z wykorzystaniem podstawowego słownictwa specjalistycznego
	Organizacja pracy	Planowanie, praca zespołowa	P55_UO	organizować swoją pracę – indywidualną oraz w zespole
Uczenie się	Planowanie własnego rozwoju i rozwoju innych	P55_UU	analizować i oceniać swoje potrzeby w zakresie uczenia się, samodzielnie korzystać z dostępnych możliwości uczenia się	
			<b>JEST GOTÓW DO:</b>	
<b>KOMPETENCJE SPOŁECZNE (K)</b>	Ocena	Krytyczne podejście	P55_KK	uznawania niepełności i niepewności posiadanej wiedzy
	Odpowiedzialność	Wypełnianie zobowiązań społecznych	P55_KO	wypełniania zobowiązań społecznych
		Działanie na rzecz interesu publicznego		uczestniczenia w działaniach na rzecz interesu publicznego, działania w sposób przedsiębiorczy
Rola zawodowa	Niezależność, rozwój etosu	P55_KR	odpowiedzialnego pełnienia ról zawodowych, w tym przestrzegania zasad etyki zawodowej	

# Charakterystyka II stopnia Polskiej Ramy Kwalifikacji typowa dla kwalifikacji uzyskiwanych po uzyskaniu kwalifikacji pełnej na poziomie 4 – poziom 5

**Zapisy – wiedza, umiejętności, kompetencje społeczne – należy odnosić do uczenia się w określonym zakresie wyższego wykształcenia**



# Charakterystyki II stopnia Polskiej Ramy Kwalifikacji typowe dla kwalifikacji uzyskiwanych w ramach szkolnictwa wyższego – poziomy 6–8

## Zapisy – wiedza, umiejętności, kompetencje społeczne – należy odnosić do uczenia się w określonym zakresie wyższego wykształcenia

	Kategorie opisowe	Aspekty o podstawowym znaczeniu	POZIOM 6	POZIOM 7	POZIOM 8
			ZNA I ROZUMIE:	ZNA I ROZUMIE:	ZNA I ROZUMIE:
WIEDZA (W)	Głębina i zakres	Kompletność perspektywy poznawczej i zależności	P6S_WG w zaawansowanym stopniu – wybrane fakty, obiekty i zjawiska oraz dotyczące ich metody i teorie wyjaśniające złożone zależności między nimi, stanowiące podstawową wiedzę ogólną z zakresu dyscyplin naukowych lub artystycznych tworzących podstawy teoretyczne oraz wybrane zagadnienia z zakresu wiedzy szczegółowej – właściwe dla programu kształcenia	P7S_WG w pogłębionym stopniu – wybrane fakty, obiekty i zjawiska oraz dotyczące ich metody i teorie wyjaśniające złożone zależności między nimi, stanowiące: • zaawansowaną wiedzę ogólną z zakresu dyscyplin naukowych lub artystycznych tworzących podstawy teoretyczne • uporządkowaną i podbudowaną teoretycznie wiedzę obejmującą kluczowe zagadnienia • wybrane zagadnienia z zakresu zaawansowanej wiedzy szczegółowej właściwe dla programu kształcenia główne trendy rozwojowe dyscyplin naukowych lub artystycznych istotnych dla programu kształcenia	P8S_WG w stopniu umożliwiającym rewizję istniejących paradygmatów – światowy dorobek obejmujący: • podstawy teoretyczne • zagadnienia ogólne i wybrane zagadnienia szczegółowe właściwe dla dyscypliny naukowej lub artystycznej  główne trendy rozwojowe dyscyplin naukowych lub artystycznych istotnych dla programu kształcenia  metodologię badań naukowych
	Kontekst	Uwarunkowania, skutki	P6S_WK fundamentalne dylematy współczesnej cywilizacji podstawowe ekonomiczne, prawne i inne uwarunkowania różnych rodzajów działań związanych z nadaną kwalifikacją, w tym podstawowe pojęcia i zasady z zakresu ochrony własności przemysłowej i prawa autorskiego	P7S_WK fundamentalne dylematy współczesnej cywilizacji ekonomiczne, prawne i inne uwarunkowania różnych rodzajów działań związanych z nadaną kwalifikacją, w tym zasady ochrony własności przemysłowej i prawa autorskiego	P8S_WK fundamentalne dylematy współczesnej cywilizacji ekonomiczne, prawne i inne istotne uwarunkowania działalności badawczej
UMIĘTNOŚCI (U)	Wykorzystanie wiedzy	Rozwiązywane problemy i wykonywane zadania	P6S_UW wykorzystywać posiadaną wiedzę – formułować i rozwiązywać złożone i nietypowe problemy oraz wykonywać zadania w warunkach nie w pełni przewidywalnych przez: • właściwy dobór źródeł oraz informacji z nich pochodzących, dokonywanie oceny, krytycznej analizy i syntezy tych informacji • dobór oraz stosowanie właściwych metod i narzędzi, w tym zaawansowanych technik informacyjno-komunikacyjnych (ICT)	P7S_UW wykorzystywać posiadaną wiedzę – formułować i rozwiązywać złożone i nietypowe problemy i innowacyjnie wykonywać zadania w nieprzewidywalnych warunkach przez: • właściwy dobór źródeł oraz informacji z nich pochodzących, dokonywanie oceny, krytycznej analizy, syntezy oraz twórczej interpretacji i prezentacji tych informacji • dobór oraz stosowanie właściwych metod i narzędzi, w tym zaawansowanych technik informacyjno-komunikacyjnych (ICT)	P8S_UW wykorzystywać wiedzę z różnych dziedzin nauki lub sztuki do twórczego identyfikowania, formułowania i innowacyjnego rozwiązywania złożonych problemów lub wykonywania zadań o charakterze badawczym, a w szczególności: • definiować cel i przedmiot badań, formułować hipotezę badawczą • rozwijać metody, techniki i narzędzia badawcze oraz twórczo je stosować • wnioskować na podstawie wyników badań  transferować wyniki prac badawczych do sfery gospodarczej i społecznej
	Komunikowanie się	Odbieranie i tworzenie wypowiedzi	P6S_UK komunikować się z użyciem specjalistycznej terminologii	P7S_UK komunikować się na tematy specjalistyczne ze zróżnicowanymi kręgami odbiorców	P8S_UK upowszechniać wyniki badań, także w formach popularnych
		Upowszechnianie wiedzy w środowisku naukowym	P6S_UK brać udział w debacie – przedstawiać i oceniać różne opinie i stanowiska oraz dyskutować o nich	P7S_UK prowadzić debatę	P8S_UK inicjować debatę uczestniczyć w dyskursie naukowym
		Posługiwanie się językiem obcym	P6S_UK posługiwać się językiem obcym na poziomie B2 Europejskiego Systemu Opisu Kształcenia Językowego	P7S_UK posługiwać się językiem obcym na poziomie B2+ Europejskiego Systemu Opisu Kształcenia Językowego oraz w wyższym stopniu w zakresie specjalistycznej terminologii	P8S_UK posługiwać się językiem obcym w stopniu umożliwiającym uczestnictwo w międzynarodowym środowisku naukowym i zawodowym
	Organizacja pracy	Planowanie i praca zespołowa	P6S_UO planować i organizować pracę – indywidualną oraz w zespole	P7S_UO kierować pracą zespołu	P8S_UO planować i realizować indywidualne i zespołowe przedsięwzięcie badawcze lub twórcze, także w środowisku międzynarodowym
	Uczenie się	Planowanie własnego rozwoju i rozwoju innych osób	P6S_UU samodzielnie planować i realizować własne uczenie się przez całe życie	P7S_UU samodzielnie planować i realizować własne uczenie się przez całe życie i ukierunkowywać innych w tym zakresie	P8S_UU samodzielnie planować i działać na rzecz własnego rozwoju oraz inspirować i organizować rozwój innych osób opracowywać programy kształcenia lub szkolenia i realizować je z wykorzystaniem nowoczesnych metod i narzędzi
KOMPETENCJE SPOŁECZNE (K)			JEST GOTÓW DO:	JEST GOTÓW DO:	JEST GOTÓW DO:
	Oceny	Krytyczne podejście	P6S_KK krytycznej oceny posiadanej wiedzy uznawania znaczenia wiedzy w rozwiązywaniu problemów poznawczych i praktycznych	P7S_KK krytycznej oceny odbieranych treści uznawania znaczenia wiedzy w rozwiązywaniu problemów poznawczych i praktycznych	P8S_KK krytycznej oceny dorobku uprawianej dyscypliny naukowej krytycznej oceny własnego wkładu w rozwój tej dyscypliny uznawania znaczenia wiedzy w rozwiązywaniu problemów poznawczych i praktycznych
	Odpowiedzialność	Wypełnianie zobowiązań społecznych	P6S_KO wypełniania zobowiązań społecznych, współorganizowania działalności na rzecz środowiska społecznego	P7S_KO wypełniania zobowiązań społecznych, inspirowania i organizowania działalności na rzecz środowiska społecznego	P8S_KO wypełniania zobowiązań społecznych badaczy i twórców
Działanie na rzecz interesu publicznego		P6S_KO inicjowania działania na rzecz interesu publicznego myślenia i działania w sposób przedsiębiorczy	P7S_KO inicjowania działania na rzecz interesu publicznego myślenia i działania w sposób przedsiębiorczy	P8S_KO inicjowania działania na rzecz interesu publicznego myślenia i działania w sposób przedsiębiorczy	
Rola zawodowa	Niezależność i rozwój etosu	P6S_KR odpowiedzialnego pełnienia ról zawodowych, w tym: • przestrzegania zasad etyki zawodowej i wymagania tego od innych • dbałości o dorobek i tradycje zawodu	P7S_KR odpowiedzialnego pełnienia ról zawodowych z uwzględnieniem zmieniających się potrzeb społecznych, w tym: • rozwijania dorobku zawodu • podtrzymywania etosu zawodu • przestrzegania i rozwijania zasad etyki zawodowej oraz działania na rzecz przestrzegania tych zasad	P8S_KR podtrzymania i rozwijania etosu środowisk badawczych i twórczych, w tym: • prowadzenia badań w sposób niezależny • respektowania zasady publicznej własności wyników badań naukowych z uwzględnieniem zasad ochrony własności intelektualnej	



## Charakterystyki II stopnia Polskiej Ramy Kwalifikacji typowe dla kwalifikacji uzyskiwanych w ramach szkolnictwa wyższego – poziomy 6–8

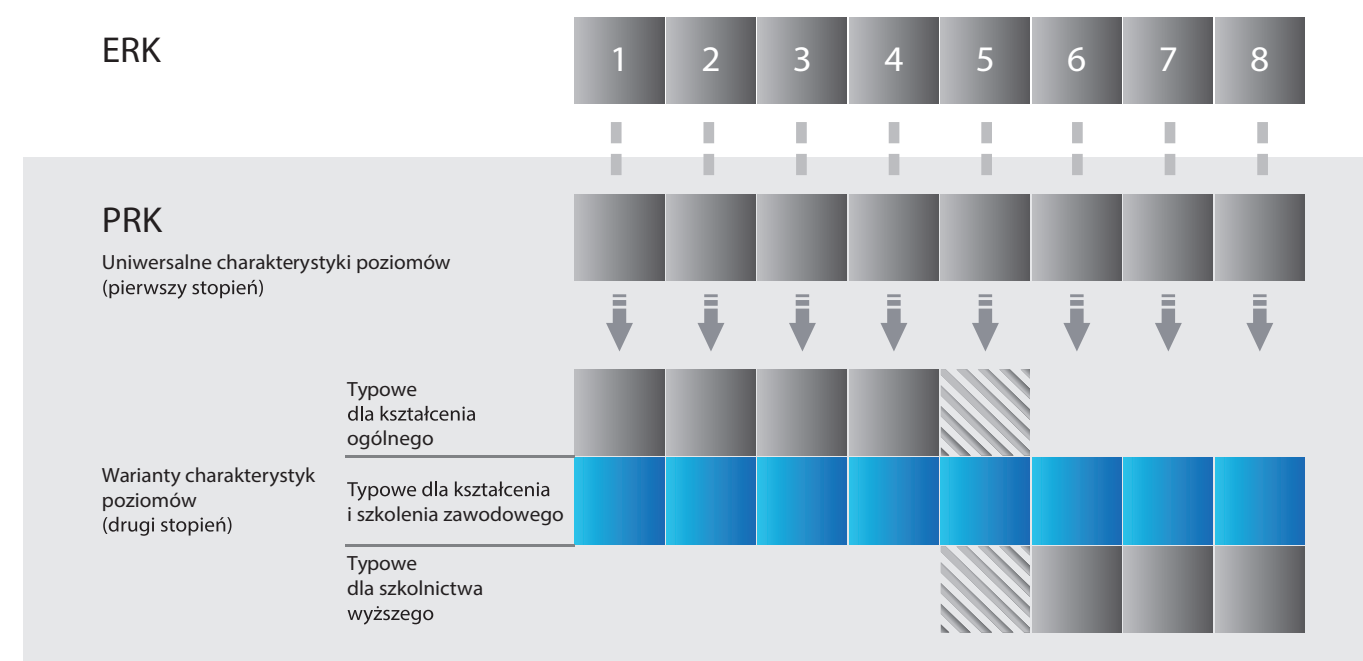
Zapisy – wiedza, umiejętności, kompetencje społeczne – należy odnosić do uczenia się w określonym zakresie wyższego wykształcenia





## Charakterystyki II stopnia Polskiej Ramy Kwalifikacji typowe dla kwalifikacji o charakterze zawodowym – poziomy 1–8

Zapisy – wiedza, umiejętności, kompetencje społeczne – należy  
odnosić do określonej działalności zawodowej



# **CURRICULUM IN THE PROFESSION OF A MECHANIC – ASSEMBLER OF MACHINES AND EQUIPMENT**

The aim of vocational training is to prepare learners to live in the conditions of the modern world, to work in their profession and to work actively in the changing labor market.

The tasks of the school and other bodies providing vocational training and their implementation are conditioned by changes in the socio-economic environment, which are influenced in particular by the economy, the globalization of economic and social processes, the increasing share in the international trade, geographic and occupational mobility, new technics and technologies, as well as increasing expectations of employers regarding the level of knowledge and skills of workers. In the process of vocational training it is important to integrate and correlate general and vocational education, including the improvement of key competences acquired in the general education process, taking into account the lower educational stages. An adequate level of general knowledge related to professional knowledge will contribute to improving the professional skills of graduates of vocational education and thus provide them with opportunities to meet the challenges of a changing labor market.

In the vocational training process, some assistance is taken to support the development of each learner according to his or her needs and capabilities, with particular providing for the individual pathways of education and careers, the opportunities for improving the level of education and professional qualifications and the prevention of early school leaving.

The flexible response of the vocational training system to the needs of the labor market, its openness to lifelong learning and the educational and occupational mobility of graduates is intended to distinguish qualifications within particular occupations included in the classification of professions in vocational education.

## **1. LEARNING OBJECTIVES**

A graduate of a vocational school of mechanic – assembler of machines and equipment should be prepared to perform the following professional tasks:

- 1) assembly of machines and equipment;
- 2) operation and maintenance of machines and equipment;
- 3) installation and activating of machines and equipment.

## **2. EDUCATIONAL OUTCOMES**

In order to perform the above-mentioned professional tasks, it is necessary to achieve the

assumed learning outcomes consisting of:

1) learning outcomes common for all professions;

(OHS). Occupational Health and Safety

Student:

1) distinguishes between concepts related to occupational health and safety, fire protection, environmental protection and ergonomics;

2) distinguishes between tasks and privileges of institutions and services operating in the field of labor protection and environmental protection in Poland;

3) defines the rights and obligations of the employee and the employer in terms of health and safety at work;

(4) predicts the risks of human health and life and property and the environment related to the performance of professional tasks;

5) identifies the hazards associated with the occurrence of harmful factors in the work environment;

6) determines the effects of harmful factors on the human body;

7) organizes the workplace in accordance to the current requirements of ergonomics, health and safety regulations, fire protection and environmental protection;

8) applies personal and collective protection measures while performing professional tasks;

(9) obeys the principles of work safety and health and applies the legal regulations on fire protection and the protection of the environment;

10) provides first aid to the casualties of accidents at work or any danger to health and life situations.

Undertaking and Performing Business Activity

The student:

1) uses the notions within the field of market economy functioning;

2) applies labor legislation regulations, protection of personal data regulations as well as tax law and copyright regulations;

3) applies business activity regulations;

4) distinguishes companies and institutions within the branch of business and the links between them;

- 5) analyses the companies' business activity;
- 6) initiates joint undertakings with diverse companies within the branch of business;
- 7) arranges all the necessary documentation indispensable to start and then perform business activity;
- 8) conducts a correspondence connected with performing business activity;
- 9) operates office equipment and uses computer software which supports performing business activity;
- 10) plans and undertakes marketing activities;
- 11) optimizes the costs and income of the operated business

#### Foreign Language for Professional Purposes

The student:

- 1) uses a large number of linguistic units (vocabulary, grammar, spelling and phonetics), which enable them to fulfill job responsibilities;
- 2) interprets utterances concerning typical job activities spoken slowly and clearly in a standard language variety;
- 3) analyses and interprets short written texts concerning typical job activities;
- 4) makes short and clear utterances and written texts which make it possible to communicate in the workplace;
- 5) uses foreign-language sources of information.

#### Personal and Social Competence

The student:

- 1) observes the rules of good behavior and ethics;
- 2) is creative and persistent;
- 3) is able to foresee the consequences of the undertaken activities;

- 4) is not afraid of changes;
- 5) is good at managing stress;
- 6) updates knowledge and improves professional skills;
- 7) keeps professional secrecy;
- 8) takes responsibility for the undertaken activities;
- 9) negotiates agreement conditions;
- 10) cooperates in a team;

2) Educational outcomes common to all professions within the car and metallurgical industries that form the framework for a group of professions connected with mechanics, mining and steel industry as well as mechanics and mechanical engineering.

Skills essential to educate the group of professionals connected with mechanics, mining and steel industry:

a mechanic - agricultural vehicles and machinery operator, a watchmaker, an optical mechanic, precise mechanic, precision mechanical devices mechanic, industrial automation and precision equipment mechanic, mechanical maintenance fitter, a motorcar mechanic, CNC operator, a locksmith, a blacksmith, a hull assembler, an auto-body mechanic, a tinman, a car sprayer, an optical technician, an aircraft technician, a marine technician, shipbuilding technician, automotive technician, mechanic technician, mechatronics fitter, electromechanical engineer, mechatronics technician, a road transport and logistics technician, power engineer technician, pattern-maker, drilling rig technician, underground mining technician, borehole mining technician, opencast mining technician, solid minerals processing technician, a founder, a metallurgist, foundry machines and equipment operator, metallurgical machines and devices operator, plastic working machines and devices operator, plastics processing machines and devices operator, a goldsmith and jeweler, a motorcycle mechanic, refrigeration and air-conditioning technician, lifting equipment technician, agricultural engineering technician, a driver and mechanic, a mechanic - timber industry machines operator, a boatbuilder.

Student:

- 1) adheres to the principles of preparing a technical drawing;



- 2) draws up machine parts sketches;
- 3) draws up technical drawings using computer techniques;
- 4) distinguishes the parts of machines and equipment;
- 5) distinguishes types of connections;
- 6) adheres to the principles of tolerance and fit;
- 7) distinguishes the construction and operating materials;
- (8) distinguishes the internal means of transport;
- 9) selects methods of transport and storage of materials;
- 10) identifies corrosion types and defines corrosion protection;
- 11) distinguishes between techniques and methods of manufacturing parts of machines and equipment;
- (12) distinguishes machines, devices and tools for manual and machine processing;
- 13) distinguishes the measuring instruments used for manual and machine processing;
- 14) performs workshop measurements;
- 15) distinguishes the methods of quality control of performed works;
- 16) defines the construction and adheres to the operating principles of machines and equipment;
- 17) uses technical documentation of machines and equipment and complies with standards for technical drawings, machine parts, construction and operating materials;
- 18) uses computer programs to assist in the performance of tasks.

PKZ (Mb) Skills which constitute the curricular background for the positions of: mechanic – operator of vehicles and farming machines, mechanic – assembler of machines and equipment, machine tool operator, motor vehicle technician, mechanic technician, mechatronics assembler,



mechatronics technician, technician of agricultural mechanization and agrotronics, mechanic – operator of /wood processing machines.

Student:

- 1) applies and adheres to the laws and the principles of technical mechanics, electrical engineering, electronics and automation;
  - 2) selects tools and measuring instruments for assembly and dismantling of machines and equipment;
  - 3) performs work in the field of mechanical and manual machining of metals;
  - 4) uses computer programs to assist in the performance of tasks.
- 3) learning outcomes appropriate to the qualification of a mechanic – assembler of machines and equipment described in part two.

M.17. Installation and operation of machines and equipment

1. Assembly of machines and equipment

Student:

- 1) recognizes construction solutions of machines and equipment;
- 2) applies methods of assembly of machines and equipment;
- 3) selects tools and instruments for the type of assembly work performed;
- 4) prepares parts of machines and equipment for assembly;
- 5) sets up machine parts, assemblies and mechanisms in the instruments and handles;
- 6) performs assembly of connections;
- 7) performs assembly of assemblies and mechanisms of machines and equipment;
- 8) performs assembly of hydraulic and pneumatic systems of machines and equipment;
- 9) checks the quality of the assembly of machines and equipment;
- 10) uses tools and appliances for the assembly of machines and equipment.

## 2. Operation of machines and equipment

Student:

- 1) characterizes the operating processes of machines and equipment;
- 2) identifies the causes of damage of machines and equipment;
- 3) obeys the rules of operation of machines and equipment;
- 4) performs maintenance and repair work on machines and equipment;
- (5) distinguishes the parts of machines and equipment;
- 6) selects materials, tools and instruments for the type of work performed;
- 7) performs repairs of components and assemblies of machines and equipment;
- 8) performs maintenance of machines and equipment;
- 9) installs machinery and equipment on the bench;
- 10) adjusts and tests the machine and its equipment;
- 11) evaluates the quality of the machine and equipment used.

## **3. REQUIREMENTS FOR IMPLEMENTATION OF FURTHER EDUCATION**

A school undertaking training in the profession of a mechanic – assembler of machines and equipment should have the following teaching facilities:

- 1) a technical drawing workshop, equipped with a computer teacher's desk connected to the local network with Internet access, a printer and a scanner and a multimedia projector, computer desks (one student station), all computers connected to a local area network with Internet access, office software package, technical drawings program, didactic aids to shape spatial imagination, norms concerning the principles of performing technical drawing, construction documentation of machines and devices;
- 2) technology laboratory, equipped with: models, sections, machines and equipment, hydraulics and pneumatic components, samples of construction and operation materials, tools and measuring devices, machine and equipment components, assembly tools, technical documentation and catalogs of machines and tools, manuals for use of machines and equipment;

3) school workshops, equipped with: machines and appliances, locksmith's tables (one table for one student), assembly work equipment and devices, lifting and transport equipment, tools and equipment for washing and maintenance, assembly presses and tooling (one press table for four students), bench drill, grinder sharpener, marking instruments, measuring tools, hand tools and machine tools, assembly tools, manuals for machines and equipment, professional manuals, technical documentation of machines and equipment, personal protective equipment. Practical training can take place in: laboratories and school workshops, lifelong learning institutions, practical training institutions and potential employment places for graduates of vocational schools.

#### 4. Minimum number of hours of further education<sup>1)</sup>

Learning outcomes common to all professions and learning outcomes common to professions within the mechanical and mining and metallurgical sectors forming foundation for training in the profession or group of professions	350 h
M.17. Installation and operation of machines and equipment	650 h

<sup>1)</sup> At school, the number of hours of further education should be adjusted to the number of hours set out in the public-school curricula framework for further education, retaining the minimum number of hours indicated in the table respectively for learning outcomes: common for all professions and common for professions forming foundation for training in the profession or group of professions and is suitable for the qualifications that are identified in the profession.

#### 5. POSSIBILITIES OF OBTAINING ADDITIONAL QUALIFICATIONS IN PROFESSIONS UNDER THE CLASSIFICATION OF FURTHER EDUCATION

Graduate of a vocational school of a mechanic – assembler of machines and equipment after confirmation of qualifications *M.17. Installation and servicing of machines and equipment* can be awarded a diploma confirming the qualifications in the mechanical engineering profession after confirmation of additional qualifications *M.44. Organization and supervision of production processes of machines and devices* and obtaining secondary education.

# PODSTAWA PROGRAMOWA KSZTAŁCENIA W ZAWODZIE

## Mechanik-monter maszyn i urządzeń

Celem kształcenia zawodowego jest przygotowanie uczących się do życia w warunkach współczesnego świata, wykonywania pracy zawodowej i aktywnego funkcjonowania na zmieniającym się rynku pracy.

Zadania szkoły i innych podmiotów prowadzących kształcenie zawodowe oraz sposób ich realizacji są uwarunkowane zmianami zachodzącymi w otoczeniu gospodarczo-społecznym, na które wpływają w szczególności: idea gospodarki opartej na wiedzy, globalizacja procesów gospodarczych i społecznych, rosnący udział handlu międzynarodowego, mobilność geograficzna i zawodowa, nowe techniki i technologie, a także wzrost oczekiwań pracodawców w zakresie poziomu wiedzy i umiejętności pracowników.

W procesie kształcenia zawodowego ważne jest integrowanie i korelowanie kształcenia ogólnego i zawodowego, w tym doskonalenie kompetencji kluczowych nabytych w procesie kształcenia ogólnego, z uwzględnieniem niższych etapów edukacyjnych. Odpowiedni poziom wiedzy ogólnej powiązanej z wiedzą zawodową przyczyni się do podniesienia poziomu umiejętności zawodowych absolwentów szkół kształcących w zawodach, a tym samym zapewni im możliwość sprostania wyzwaniom zmieniającego się rynku pracy.

W procesie kształcenia zawodowego są podejmowane działania wspomagające rozwój każdego uczącego się, stosownie do jego potrzeb i możliwości, ze szczególnym uwzględnieniem indywidualnych ścieżek edukacji i kariery, możliwości podnoszenia poziomu wykształcenia i kwalifikacji zawodowych oraz zapobiegania przedwczesnemu kończeniu nauki.

Elastycznemu reagowaniu systemu kształcenia zawodowego na potrzeby rynku pracy, jego otwartości na uczenie się przez całe życie oraz mobilności edukacyjnej i zawodowej absolwentów ma służyć wyodrębnienie kwalifikacji w ramach poszczególnych zawodów wpisanych do klasyfikacji zawodów szkolnictwa zawodowego.

### 1. CELE KSZTAŁCENIA

Absolwent szkoły kształcącej w zawodzie mechanik-monter maszyn i urządzeń powinien być przygotowany do wykonywania następujących zadań zawodowych:

- 1) dokonywania montażu maszyn i urządzeń;
- 2) obsługi i konserwowania maszyn i urządzeń;
- 3) instalowania i uruchamiania maszyn i urządzeń.

### 2. EFEKTY KSZTAŁCENIA

Do wykonywania wyżej wymienionych zadań zawodowych niezbędne jest osiągnięcie zakładanych efektów kształcenia, na które składają się:

1) efekty kształcenia wspólne dla wszystkich zawodów;

### **(BHP). Bezpieczeństwo i higiena pracy**

Uczeń:

- 1) rozróżnia pojęcia związane z bezpieczeństwem i higieną pracy, ochroną przeciwpożarową, ochroną środowiska i ergonomią;
- 2) rozróżnia zadania i uprawnienia instytucji oraz służb działających w zakresie ochrony pracy i ochrony środowiska w Polsce;
- 3) określa prawa i obowiązki pracownika oraz pracodawcy w zakresie bezpieczeństwa i higieny pracy;
- 4) przewiduje zagrożenia dla zdrowia i życia człowieka oraz mienia i środowiska związane z wykonywaniem zadań zawodowych;
- 5) określa zagrożenia związane z występowaniem szkodliwych czynników w środowisku pracy;
- 6) określa skutki oddziaływania czynników szkodliwych na organizm człowieka;
- 7) organizuje stanowisko pracy zgodnie z obowiązującymi wymaganiami ergonomii, przepisami bezpieczeństwa i higieny pracy, ochrony przeciwpożarowej i ochrony środowiska;
- 8) stosuje środki ochrony indywidualnej i zbiorowej podczas wykonywania zadań zawodowych;
- 9) przestrzega zasad bezpieczeństwa i higieny pracy oraz stosuje przepisy prawa dotyczące ochrony przeciwpożarowej i ochrony środowiska;
- 10) udziela pierwszej pomocy poszkodowanym w wypadkach przy pracy oraz w stanach zagrożenia zdrowia i życia.

### **(PDG). Podejmowanie i prowadzenie działalności gospodarczej**

Uczeń:

- 1) stosuje pojęcia z obszaru funkcjonowania gospodarki rynkowej;
- 2) stosuje przepisy prawa pracy, przepisy prawa dotyczące ochrony danych osobowych oraz przepisy prawa podatkowego i prawa autorskiego;
- 3) stosuje przepisy prawa dotyczące prowadzenia działalności gospodarczej;
- 4) rozróżnia przedsiębiorstwa i instytucje występujące w branży i powiązania między nimi;
- 5) analizuje działania prowadzone przez przedsiębiorstwa funkcjonujące w branży;

- 6) inicjuje wspólne przedsięwzięcia z różnymi przedsiębiorstwami z branży;
- 7) przygotowuje dokumentację niezbędną do uruchomienia i prowadzenia działalności gospodarczej;
- 8) prowadzi korespondencję związaną z prowadzeniem działalności gospodarczej;
- 9) obsługuje urządzenia biurowe oraz stosuje programy komputerowe wspomagające prowadzenie działalności gospodarczej;
- 10) planuje i podejmuje działania marketingowe prowadzonej działalności gospodarczej;
- 11) optymalizuje koszty i przychody prowadzonej działalności gospodarczej.

### **(JOZ). Język obcy ukierunkowany zawodowo**

Uczeń:

- 1) posługuje się zasobem środków językowych (leksykalnych, gramatycznych, ortograficznych oraz fonetycznych), umożliwiających realizację zadań zawodowych;
- 2) interpretuje wypowiedzi dotyczące wykonywania typowych czynności zawodowych artykułowane powoli i wyraźnie, w standardowej odmianie języka;
- 3) analizuje i interpretuje krótkie teksty pisemne dotyczące wykonywania typowych czynności zawodowych;
- 4) formułuje krótkie i zrozumiałe wypowiedzi oraz teksty pisemne umożliwiające komunikowanie się w środowisku pracy;
- 5) korzysta z obcojęzycznych źródeł informacji.

### **(KPS). Kompetencje personalne i społeczne**

Uczeń:

- 1) przestrzega zasad kultury i etyki;
- 2) jest kreatywny i konsekwentny w realizacji zadań;
- 3) przewiduje skutki podejmowanych działań;
- 4) jest otwarty na zmiany;
- 5) potrafi radzić sobie ze stresem;
- 6) aktualizuje wiedzę i doskonali umiejętności zawodowe;
- 7) przestrzega tajemnicy zawodowej;

8) potrafi ponosić odpowiedzialność za podejmowane działania;

9) potrafi negocjować warunki porozumień;

10) współpracuje w zespole.

2) efekty kształcenia wspólne dla zawodów w ramach obszaru mechanicznego i górnictwo-hutniczego, stanowiące podbudowę do kształcenia w zawodzie lub grupie zawodów PKZ(M.a) i PKZ(M.b);

**PKZ(M.a) Umiejętności stanowiące podbudowę do kształcenia w zawodach: mechanik-operator pojazdów i maszyn rolniczych, zegarmistrz, optyk-mechanik, mechanik precyzyjny, mechanik automatyki przemysłowej i urządzeń precyzyjnych, mechanik-monter maszyn i urządzeń, mechanik pojazdów samochodowych, operator obrabiarek skrawających, ślusarz, kowal, monter kadłubów okrętowych, blacharz samochodowy, blacharz, lakiernik, technik optyk, technik mechanik lotniczy, technik mechanik okrętowy, technik budownictwa okrętowego, technik pojazdów samochodowych, technik mechanik, monter mechatronik, elektromechanik pojazdów samochodowych, technik mechatronik, technik transportu drogowego, technik energetyk, modelarz odlewniczy, technik wiertnik, technik górnictwa podziemnego, technik górnictwa otworowego, technik górnictwa odkrywkowego, technik przeróbki kopalin stałych, technik odlewnik, technik hutnik, operator maszyn i urządzeń odlewniczych, operator maszyn i urządzeń metalurgicznych, operator maszyn i urządzeń do obróbki plastycznej, operator maszyn i urządzeń do przetwórstwa tworzyw sztucznych, złotnik-jubiler, mechanik motocyklowy, technik chłodnictwa i klimatyzacji, technik urządzeń dźwigowych, technik mechanizacji rolnictwa i agrotechniki, kierowca mechanik, mechanik-operator maszyn do produkcji drzewnej, szkutnik**

Uczeń:

1) przestrzega zasad sporządzania rysunku technicznego maszynowego;

2) sporządza szkice części maszyn;

3) sporządza rysunki techniczne z wykorzystaniem technik komputerowych;

4) rozróżnia części maszyn i urządzeń;

5) rozróżnia rodzaje połączeń;

6) przestrzega zasad tolerancji i pasowań;

7) rozróżnia materiały konstrukcyjne i eksploatacyjne;

8) rozróżnia środki transportu wewnętrznego;

9) dobiera sposoby transportu i składowania materiałów;

10) rozpoznaje rodzaje korozji oraz określa sposoby ochrony przed korozją;

- 11) rozróżnia techniki i metody wytwarzania części maszyn i urządzeń;
- 12) rozróżnia maszyny, urządzenia i narzędzia do obróbki ręcznej i maszynowej;
- 13) rozróżnia przyrządy pomiarowe stosowane podczas obróbki ręcznej i maszynowej;
- 14) wykonuje pomiary warsztatowe;
- 15) rozróżnia metody kontroli jakości wykonanych prac;
- 16) określa budowę oraz przestrzega zasad działania maszyn i urządzeń;
- 17) posługuje się dokumentacją techniczną maszyn i urządzeń oraz przestrzega norm dotyczących rysunku technicznego, części maszyn, materiałów konstrukcyjnych i eksploatacyjnych;
- 18) stosuje programy komputerowe wspomagające wykonywanie zadań.

**PKZ(M.b) Umiejętności stanowiące podbudowę do kształcenia w zawodach: mechanik-operator pojazdów i maszyn rolniczych, mechanik-monter maszyn i urządzeń, operator obrabiarek skrawających, technik pojazdów samochodowych, technik mechanik, monter mechatronik, technik mechatronik, technik mechanizacji rolnictwa i agrotechniki, mechanik-operator maszyn do produkcji drzewnej**

Uczeń:

- 1) stosuje prawa i przestrzega zasad mechaniki technicznej, elektrotechniki, elektroniki i automatyki;
  - 2) dobiera narzędzia i przyrządy pomiarowe do montażu i demontażu maszyn i urządzeń;
  - 3) wykonuje prace z zakresu obróbki ręcznej i maszynowej metali;
  - 4) stosuje programy komputerowe wspomagające wykonywanie zadań.
- 3) efekty kształcenia właściwe dla kwalifikacji wyodrębnionej w zawodzie mechanik-monter maszyn i urządzeń opisane w części II:

## **M.17. Montaż i obsługa maszyn i urządzeń**

### **1. Montaż maszyn i urządzeń**

Uczeń:

- 1) rozpoznaje rozwiązania konstrukcyjne maszyn i urządzeń;
- 2) stosuje metody montażu maszyn i urządzeń;



- 3) dobiera narzędzia i przyrządy do rodzaju wykonywanych prac montażowych;
- 4) przygotowuje części maszyn i urządzeń do montażu;
- 5) ustawia części maszyn, zespołów i mechanizmów w przyrządach i uchwytach;
- 6) wykonuje montaż połączeń;
- 7) wykonuje montaż zespołów i mechanizmów maszyn i urządzeń;
- 8) wykonuje montaż układów hydraulicznych i pneumatycznych maszyn i urządzeń;
- 9) sprawdza jakość wykonanego montażu maszyn i urządzeń;
- 10) posługuje się narzędziami, przyrządami i urządzeniami do montażu maszyn i urządzeń.

## **2. Obsługa maszyn i urządzeń**

Uczeń:

- 1) charakteryzuje procesy eksploatacyjne maszyn i urządzeń;
- 2) określa przyczyny uszkodzeń maszyn i urządzeń;
- 3) przestrzega zasad obsługi maszyn i urządzeń;
- 4) wykonuje prace konserwacyjno-naprawcze maszyn i urządzeń;
- 5) rozróżnia części maszyn i urządzeń;
- 6) dobiera materiały, narzędzia i przyrządy do rodzaju wykonywanej pracy;
- 7) wykonuje naprawy elementów i zespołów maszyn i urządzeń;
- 8) wykonuje konserwację maszyn i urządzeń;
- 9) instaluje maszyny i urządzenia na stanowisku;
- 10) dokonuje regulacji i próbnego uruchomienia maszyny i urządzenia;
- 11) ocenia jakość wykonanej obsługi maszyn i urządzeń.

## **3. WARUNKI REALIZACJI KSZTAŁCENIA W ZAWODZIE**

Szkoła podejmująca kształcenie w zawodzie mechanik-monter maszyn i urządzeń powinna posiadać następujące pomieszczenia dydaktyczne:

- 1) pracownię rysunku technicznego, wyposażona w: stanowisko komputerowe dla nauczyciela podłączone do sieci lokalnej z dostępem do Internetu, z drukarką i ze skanerem oraz z projekтором multimedialnym, stanowiska komputerowe (jedno

stanowisko dla jednego ucznia), wszystkie komputery podłączone do sieci lokalnej z dostępem do Internetu, pakiet programów biurowych, program do wykonywania rysunku technicznego, pomoce dydaktyczne do kształtowania wyobraźni przestrzennej, normy dotyczące zasad wykonywania rysunku technicznego maszynowego, dokumentacje konstrukcyjne maszyn i urządzeń;

2) pracownię technologii, wyposażoną w: modele, przekroje, atrapy maszyn i urządzeń, elementy układów hydraulicznych i pneumatycznych, próbki materiałów konstrukcyjnych i eksploatacyjnych, narzędzia i przyrządy pomiarowe, elementy maszyn i urządzeń, narzędzia do montażu, dokumentację techniczną oraz katalogi maszyn i narzędzi, instrukcje obsługi maszyn i urządzeń;

3) warsztaty szkolne, wyposażone w: maszyny i urządzenia, stoły ślusarskie (jeden stół dla jednego ucznia), urządzenia i przyrządy do prac montażowych, urządzenia dźwigowe i transportu wewnętrznego, narzędzia i urządzenia do mycia i konserwacji, prasy montażowe z oprzyrządowaniem (jedna prasa dla czterech uczniów), wiertarkę stołową, szlifierkę ostrzałkę, przyrządy traserskie, przyrządy pomiarowe, narzędzia do obróbki ręcznej i maszynowej skrawaniem, narzędzia monterskie, instrukcje obsługi maszyn i urządzeń, poradniki zawodowe, dokumentacje techniczne maszyn i urządzeń, środki ochrony indywidualnej.

Kształcenie praktyczne może odbywać się w: pracowniach i warsztatach szkolnych, placówkach kształcenia ustawicznego, placówkach kształcenia praktycznego oraz podmiotach stanowiących potencjalne miejsce zatrudnienia absolwentów szkół kształcących w zawodzie.

#### **4. Minimalna liczba godzin kształcenia zawodowego<sup>1)</sup>**

Efekty kształcenia wspólne dla wszystkich zawodów oraz efekty kształcenia wspólne dla zawodów w ramach obszaru mechanicznego i górniczno-hutniczego stanowiące podbudowę do kształcenia w zawodzie lub grupie zawodów	350 godz.
M.17. Montaż i obsługa maszyn i urządzeń	650 godz.

<sup>1)</sup> W szkole liczbę godzin kształcenia zawodowego należy dostosować do wymiaru godzin określonego w przepisach w sprawie ramowych planów nauczania w szkołach publicznych, przewidzianego dla kształcenia zawodowego, zachowując minimalną liczbę godzin wskazanych w tabeli odpowiednio dla efektów kształcenia: wspólnych dla wszystkich zawodów i wspólnych dla zawodów w ramach obszaru kształcenia stanowiących podbudowę do kształcenia w zawodzie lub grupie zawodów oraz właściwych dla kwalifikacji wyodrębnionych w zawodzie.

#### **5. MOŻLIWOŚCI UZYSKIWANIA DODATKOWYCH KWALIFIKACJI W ZAWODACH W RAMACH OBSZARU KSZTAŁCENIA OKREŚLONEGO W KLASYFIKACJI ZAWODÓW SZKOLNICTWA ZAWODOWEGO**

Absolwent szkoły kształcącej w zawodzie mechanik-monter maszyn i urządzeń po potwierdzeniu kwalifikacji *M.17. Montaż i obsługa maszyn i urządzeń* może uzyskać dyplom potwierdzający kwalifikacje w zawodzie technik mechanik po potwierdzeniu dodatkowo kwalifikacji *M.44. Organizacja i nadzorowanie procesów produkcji maszyn i urządzeń* oraz uzyskaniu wykształcenia średniego.

