OCCUPATIONAL QUALIFICATION STANDARD

Diploma Mechanical Engineer, EstQF Level 7

An occupational qualification standard is a document which describes the set of skills, knowledge and attitudes, i.e. competence requirements, needed to successfully accomplish duties. Occupational qualification standards are used for compiling curricula and awarding qualifications.

Occupational title	Level of Estonian Qualifications Framework (EstQF)
Diploma Mechanical Engineer, EstQF Level 7	7

Possible specialisation and titles on occupational certificate	
Specialisation	**Title on occupational qualification certificate**
Product development	Diploma Mechanical Engineer, EstQF Level 7 Product development
Production engineering	Diploma Mechanical Engineer, EstQF Level 7 Production engineering
Mechanical and robotic systems	Diploma Mechanical Engineer, EstQF Level 7 Mechanical and robotic systems

Part A
DESCRIPTION OF WORK

A.1 Description of work

Mechanical engineers create engineering solutions and ensure that products, machines and systems function efficiently and safely.
They work in the fields of mechanical engineering, engineering and production technology (e.g. the metal, mechanical, aeronautical, automobile, timber, food and chemical industries, agricultural equipment and energetics).
Three occupational standards have been developed for the occupation:
a) Mechanical Engineer, Level 6
b) Diploma Mechanical Engineer, Level 7
c) Chartered Mechanical Engineer, Level 8

Diploma Mechanical engineer, Level 7 is an experienced technical or technology specialist who develops products or technologies and guarantees the reliability and safety of equipment and systems.
A certified mechanical engineer specialises in product development, production engineering and mechanical and robotic systems.

A Diploma Mechanical Engineer operates in difficult situations that require an innovative approach. They are required to work in a team with specialists from connected fields, lead working groups and take responsibility for the performance of employees.

A.2 Tasks

A.2.1 Mechanical engineering
1. Fulfilling technical engineering tasks
2. Using Information and Communication Technology (ICT)
3. Fulfilling occupational norms

A.2.2 Cooperation and supervision
1. Cooperation and management
2. Supervision

Specialised areas of work
Product development A.2.3 Product development 1. Developing new products and technical solutions 2. Improving existing products and technical solutions 3. Analysis of product life cycle and environmental impact Production engineering A.2.4 Production engineering 1. Production management 2. Technology design 3. Designing technological processes and systems 4. Developing and implementing production equipment 5. Organising the maintenance and repair of production equipment and systems Mechanical and robotic systems A.2.5 Mechanical and robotic systems 1. Designing mechanical and robotic systems 2. Designing robot technologies 3. Using ICT when implementing mechanical and robotic systems 4. Planning the maintenance and repair of mechanical and robotic systems
A.3 Work environment and specific nature of work
Mechanical engineers work in offices and production plants and on internal and external sites. General work safety requirements must be met when working in production plants and on sites. Working hours can be flexible.
A.4 Tools
ICT tools, software, specific calculation and drawing programmes and other tools.
A.5 Personal qualities required for work: abilities and characteristics
The work requires engineer-like logical thinking, creativity, independence, decisiveness, analytical skills, accuracy, responsibility, communication and cooperation, spatial imagination, empathy and adaptability, assertiveness, organisational skills and stress tolerance.
A.6 Professional preparation
Diploma Mechanical Engineer, Level 7 has generally completed a Master's degree or acquired a Level 6 Mechanical Engineer occupational qualification and completed further training. Professional experience is required in both cases.
A.7 Most common occupational titles
Designer, project manager, robotics engineer, CAD/CAM engineer, process engineer, production manager, process engineer, quality engineer, technologist, mechatronic engineer, service manager, product development engineer, production engineer, production manager, stress analysis engineer, etc.
A.8 Regulations governing profession
The design, construction and operation of production systems and equipment are regulated by relevant international and national regulations (machinery directive, Equipment Safety Act, etc.). Design is further guided by regulations in the fields of construction, medicine, thermal energy, etc.

Part B
COMPETENCY REQUIREMENTS

B.1 Structure of occupation
Competences B.2.1 and B.2.2 and at least one competence connected to the specialisation from options B.2.3-B.2.5 must be certified when applying for the qualification of Diploma Mechanical Engineer, Level 7.

B.2 Competences

MANDATORY COMPETENCES

B.2.1 Mechanical engineering	EstQF Level 7
Performance indicators: 1. Identifies and solves engineering tasks using relevant general engineering knowledge (mathematics, physics, engineering mechanics, materials technology, etc.) and economic knowledge (business studies, business processes, etc.); 2. Finds the best solutions to professional problems using experience and relevant engineering knowledge (product design and environmentally friendly design principles and methodologies; production equipment and systems, technical diagnostics methods for products and equipment; product manufacturing technologies and methods; components of hydraulics and pneumatics; modelling, designing tools; technological production processes and systems, etc.); 3. Uses mechanical engineering-related solution methods across technical and economic fields (e.g. ICT, electricity and thermal engineering); 4. Assesses the applicability of technologies taking into consideration user needs, the market situation and restrictions; 5. Uses a computer for information processing, communication, safety and problem-solving at the independent user level and for content creation at the experienced user level, Annex 1 – Scale of self-assessment in digital competence; 6. Uses appropriate hardware and contemporary modelling, simulation, analysis and synthesis techniques and other software solutions to solve professional problems; 7. Keeps up to date with developments in digital technology and supports others in improving their ICT skills; 8. Sets ICT-related tasks and places orders with professionals to find solutions; 9. Complies with basic data protection requirements; 10. Meets the requirements of standards and regulations associated with the occupation (quality management systems, occupational safety, environmental protection and energy efficiency); 11. Their work is guided by the requirements of the professional ethics of engineers, Annex 2 – Engineer's professional ethics and code of conduct; 12. Supports the wider promotion of the work and occupation of engineering through their actions and protects the interests of the occupation; 13. Maintains their qualifications, keeps up to date on technological developments and proposes innovations (e.g. to improve energy efficiency); 14. Navigates the various aspects of the occupation and makes proposals for innovative changes; 15. Mediates and provides technical information for everybody in a comprehensive manner and participates actively in discussions and meetings; 16. Uses at least one foreign language at the B2 level, Annex 3 – Language skills level descriptions.	
B.2.2 Cooperation and supervision	**EstQF Level 7**
Performance indicators: 1. Builds relationships and works with individuals, colleagues and clients, focusing on operational objectives; 2. Explains and justifies their viewpoints and is able to negotiate agreements within the team as well as between third parties; 3. Manages various social situations, including conflicts, using appropriate communication methods and taking into account differences of opinion; 4. As team leader, sets the team's objectives, delegates work appropriately and fairly and is responsible for its completion; 5. Passes on professional skills and knowledge and coordinates the work of those supervised.	

COMPETENTCES RELATED TO SPECIALISATION

When applying for the qualification of Diploma Mechanical Engineer, Level 7 must be certified at least one competence connected to the specialisation from options B.2.3-B.2.5.

Product development	
B.2.3 Product development	**EstQF Level 7**
Performance indicators: 1. Designs new products and technical solutions using appropriate professional design and analysis software (CAM, CAD, FEM, etc.); 2. Sets out the design conditions and performance indicators for the proposed product and technical solutions according to the terms of reference; 3. Improves existing products and technical solutions using appropriate professional design and analysis software (CAM, CAD, FEM, etc.); 4. Models innovative, environmentally friendly and sustainable products and, if necessary, prepares prototypes corresponding to the blueprints; 5. Designs prototype-testing based on the task; 6. Prepares the final product documentation according to established requirements. 7. Analyses the environmental impact of the product using appropriate methodologies; 8. Plans the life cycle of the product based on environmental impact.	

Production engineering	
B.2.4 Production engineering	**EstQF Level 7**
Performance indicators: 1. Organises production using suitable software (e.g. ERP) and following the established production plan; 2. Coordinates project activities according to the schedule; 3. Designs fabrication technologies based on the manufactured product using suitable design software (CAD, CAM); 4. Improves existing fabrication technologies to improve production processes; 5. Tests technologies in virtual and real environments; 6. Designs and improves technological processes and systems based on technological capabilities and software; 7. Simulates processes and systems in a virtual environment; 8. Tests processes and systems in a production environment; 9. Designs new or improves existing production equipment; 10. Combines and integrates the created devices into the production system; 11. Plans a maintenance plan for equipment and systems according to the company's maintenance strategy, ensuring the reliability and safety of equipment and systems; 12. Organises the maintenance of equipment and systems in accordance with the maintenance plan.	

Mechanical and robotic systems	
B.2.5 Mechanical and robotic systems	**EstQF Level 7**
Performance indicators: 1. Designs and improves intelligent machine and robot systems (including collaborative robots) using modern technologies; 2. Oversees machine and robot system installation in the working environment; 3. Prepares a risk analysis of a robot's work environment based on the nature of the work and established environmental requirements; 4. Designs new and improves existing technologies; 5. Ensures the reliability of the technology, following the company's strategy; 6. Develops a maintenance plan for machine and robot systems; 7. Simulates machine and robot systems in a virtual environment; 8. Designs computer networks and information systems in cooperation with ICT specialists; 9. Administers operating systems using professional programmes related to the system; 10. Plans maintenance and repair work, preparing the maintenance plan according to the user and maintenance manuals; 11. Organises maintenance and repair work, following the maintenance plan.	

Part C
GENERAL INFORMATION AND ANNEXES

C.1 Information concerning compilation and certification of occupational qualification standard and reference to classification of occupations	
1. ID of occupational qualification standard in register of occupational qualifications	24-08112018-1.1.2/6k
2. Occupational qualification standard compiled by:	Oliver Mets, INSERO OÜ Vello Vainola, Tallinna Tehnikakõrgkool Veljo Konnimois, RadiusTech OÜ Andre Laanemets, SKF Estonia OÜ Priit Kulu, Tallinna Tehnikaülikool Kristo Vaher, Eesti Mehaanikainseneride Liit
3. Occupational qualification standard approved by:	Engineering, Manufacturing and Processing
4. No. of decision of Sectoral Council	10
5. Date of decision of Sectoral Council	08.11.2018
6. Occupational qualification standard valid until	07.11.2023
7. Occupational qualification standard version no.	6
8. Reference to International Standard Classification of Occupations (ISCO 08)	2144 Mechanical Engineers
9. Reference to European Qualifications Framework (EQF)	7
C.2 Occupational title in foreign language	
English:	Diploma Mechanical Engineer, EstQF Level 7
C.3 Annexes	
Lisa 1 Scale of self-assessment in digital competence	
Lisa 2 Engineer's Professional Ethics and Code Of Conduct	
Lisa 3 Language skills level descriptions	