OCCUPATIONAL QUALIFICATION STANDARD

Chartered Mechanical Engineer, EstQF Level 8

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)
Chartered Mechanical Engineer, EstQF Level 8	8

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 qualification standards have been developed for the occupation: a) Mechanical Engineer, Level 6 b) Diploma Mechanical Engineer, Level 7 c) Chartered Mechanical Engineer, Level 8 Chartered Mechanical Engineer, Level 8 is a technical or technology professional with extensive knowledge and experience who develops and creates innovative engineering solutions in at least one of the following subfields: - product development; - research activity and training; - production engineering; - materials engineering; - welding engineering; - mechanical and robotic systems; - maintenance of equipment and systems. An chartered mechanical engineer works in situations that demand mastery, that are complex and undefined and that may require new strategic approaches. They lead a team or organisation and coordinate work between connected fields.
A.2 Tasks
A.2.1 Mechanical engineering 1. Fulfilling technical engineering tasks 2. Using information and communications technology (ICT) 3. Fulfilling occupational norms A.2.2 Management and supervision 1. Management 2. Supervision
Elective areas of work
A.2.3 Research activity and training 1. Research and development 2. Educational and education methodology activities 3. Working as an expert

A.2.4 Product development 1. Developing innovative products and technical solutions 2. Project management 3. Working as an expert A.2.5 Production engineering 1. Production management 2. Creating innovative technologies 3. Creating innovative technological processes and systems 4. Developing and implementing production equipment 5. Working as an expert A.2.6 Materials engineering 1. Creating innovative engineering materials 2. Creating and implementing innovative materials technologies 3. Working as an expert A.2.7 Welding engineering 1. Developing new calculation methods for welded structures 2. Designing and implementing innovative welding technologies 3. Designing quality systems for welding 4. Working as an expert A.2.8 Mechanical and robotic systems 1. Designing mechanical and robotic systems 2. Designing robot technologies 3. Using ICT when implementing mechanical and robotic systems 4. Working as an expert A.2.9 Maintenance of equipment and systems 1. Maintenance strategy design 2. Maintenance management 3. Working as an expert
A.3 Work environment and specific nature of work
Mechanical engineers work in offices, manufacturing enterprises and at indoor and outdoor 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 equipment, software, specific calculation and drawing programmes and other equipment.
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
Chartered Mechanical Engineer, Level 8 has completed Doctoral studies or received the qualification of Diploma Mechanical Engineer, Level 7. In both instances, professional work experience and refresher training are required.
A.7 Most common occupational titles
Designer, product development engineer, project manager, production manager, production engineer, manager of operations, consultant, expert, development manager, welding coordinator, structural 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. Training must be completed in welding coordination that complies with the standard of welding coordination when working in welding engineering.

Part B
COMPETENCY REQUIREMENTS

B.1 Structure of occupation
Competences B.2.1 and B.2.2 and at least one of the optional competences from B.2.3-B.2.9. must be certified when applying for the qualification of Chartered Mechanical Engineer, Level 8.

B.2 Competences

MANDATORY COMPETENCES

B.2.1 Mechanical engineering	EstQF Level 8
Performance indicators 1. Identifies and solves engineering tasks in an innovative and creative way 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 for difficult professional problems using experience and advanced professional knowledge; 3. Uses and develops 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. Takes part in international professional working groups; 6. 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; 7. Uses appropriate hardware and contemporary modelling, simulation, analysis and synthesis techniques and other software solutions to solve professional problems; 8. Keeps up to date with developments in digital technology and supports others in improving their ICT skills; 9. Sets ICT-related tasks and places orders with professionals to find solutions; 10. Complies with basic data protection requirements; 11. Meets the requirements of standards and regulations associated with the occupation (quality management systems, occupational safety, environmental protection and energy efficiency); 12. Their work is guided by the requirements of the professional ethics of engineers, Annex 2 – Engineer's professional ethics and code of conduct; 13. Supports the wider promotion of the work and occupation of engineering through their actions and protects the interests of the occupation; 14. Maintains their qualifications, keeps up to date on technological developments and proposes innovations (e.g. to improve energy efficiency); 15. Mediates and provides technical information for everybody in a comprehensive manner and initiates and takes part in discussions; 16. Uses at least one foreign language at the B2 level, Annex 3 – Language skills level descriptions.	
B.2.2 Management and supervision	**EstQF Level 8**
Performance indicators	

1. Leads teams by planning and initiating activities and collecting the information required for the high-quality performance of duties; 2. Guides, involves and encourages team members by applying the appropriate methods of management and remuneration; 3. Observes and checks work performance, giving appropriate feedback in a timely manner; 4. Determines the development needs of employees and creates development opportunities for them; 5. Manages, plans and coordinates projects; 6. Passes on professional skills and knowledge and coordinates the work of those supervised; 7. Draws up plans for supervising employees, describing the required competences and setting goals for the process of supervision.

OPTIONAL COMPETENCES

When applying for the qualification of Chartered Mechanical Engineer, Level 8 must be certified at least one of the optional competences from B.2.3-B.2.9

B.2.3 Research activity and training	**EstQF Level 8**
Performance indicators 1. Conducts research and development projects on the basis of the research topic and methodologies, leading the work of the research team; 2. Publishes and presents research results according to the research topic; 3. Applies for patents and utility certificates pursuant to the established procedure; 4. Conducts teaching based on the goals and learning outcomes of curricula and subjects using the appropriate technologies and technological means to achieve them; 5. Compiles teaching materials in the subject field; 6. Supervises Master's and Doctoral theses in the subject field; 7. Draws up expert reports, scientific articles and reviews of teaching materials and theses in the proper manner; 8. Reviews the Doctoral theses in their field through academic discussion.	
B.2.4 Product development	**EstQF Level 8**
Performance indicators 1. Designs innovative products based on the design solution; 2. Selects and uses design and analysis software (CAM, CAD, FEM, etc.) based on the specific nature of the product being developed; 3. Supervises the production and testing of prototypes; 4. Analyses and designs the environmental impact of the various life cycles of the product using appropriate methodologies; 5. Applies for patents or utility certificates pursuant to the established procedure; 6. Establishes a project team and organises its work; 7. Manages, plans and coordinates projects; 8. Coordinates project activities in accordance with the schedule; 9. Assesses the choice of materials and the designing of the life cycle when developing innovative products, taking into account the environmental impact; 10. Conducts the testing of products in accordance with testing methodologies; 11. Compiles expert reports in their field using the appropriate methodologies.	
B.2.5 Production engineering	**EstQF Level 8**
Performance indicators 1. Plans resources using suitable software (e.g. ERP); 2. Plans and manages production using the appropriate production software. 3. Designs innovative production technologies based on the product being made or designed, using appropriately chosen design software (CAD or CAM); 4. Coordinates the improvements made to and testing of production technologies; 5. Coordinates the design and improvement of innovative technological processes and systems based on the available technology; 6. Simulates processes and systems in a virtual environment;	

7. Coordinates the testing of processes and systems in the real production environment; 8. Designs innovative production equipment or improves existing production equipment; 9. Combines and integrates the created equipment into the production system; 10. Assesses the implementation of technological processes in production based on quality standards and production efficiency; 11. Manages and assesses the compliance of production and technology with the technological documentation and standards of the enterprise; 12. Compiles expert reports in their field using the appropriate methodologies.	
B.2.6 Materials engineering	**EstQF Level 7**
Performance indicators 1. Models innovative materials and conducts materials research based on the terms of reference and methodologies of the project; 2. Tests materials based on the methodology; 3. Supervises the production and testing of the prototypes of products made from innovative materials based on the methodology; 4. Designs innovative materials technologies by conducting technological research; 5. Organises the pilot production of materials based on the methodology. 6. Implements new materials technologies to produce products based on the goals set for the product and production and environmental requirements; 7. Assesses the choice of materials and technologies based on the documentation and analysis; 8. Compiles expert reports in the field of materials and materials technologies using appropriate methodologies.	
B.2.7 Welding engineering	**EstQF Level 7**
Performance indicators 1. Calculates welded structures and simulates them in a virtual environment; 2. Improves the calculations of welded structures with new calculation methods; 3. Designs and implements new welding technologies or improves existing welding technologies (incl. robot welding); 4. Designs welding technologies for new materials; 5. Tests technologies in virtual and real environments; 6. Combines and integrates the created technologies into the production system; 7. Designs and distributes new welding quality systems and improves existing welding quality systems. 8. Assesses the compliance of the materials and welding technologies used with quality standards in the course of monitoring; 9. Identifies and analyses the causes of the fracturing of welds and welded structures; 10. Compiles expert reports in the field of welded structures and welding technologies using appropriate methodologies.	
B.2.8 Mechanical and robotic systems	**EstQF Level 8**
Performance indicators 1. Designs innovative machine and robotic systems (incl. collaborative robots) using modern technologies (artificial intelligence, machine vision, telematics, etc.); 2. Models and tests mechanical and robotic system solutions in virtual and real work environments; 3. Develops methodologies for risk analysis; 4. Creates innovative technologies (incl. ‘soft robots’ and artificial intelligence); 5. Develops a maintenance strategy and updates it, taking into account the key indicators of the enterprise; 6. Simulates innovative machine and robot systems in a virtual environment; 7. Assesses the choice of machines and robots in the system with regard to the overall solution; 8. Analyses the causes of standstills and non-compliances; 9. Compiles expert assessments in the field of mechanical and robotic systems using the appropriate methodology.	
B.2.9 Maintenance of equipment and systems	**EstQF Level 7**
Performance indicators 1. Develops a maintenance strategy and updates it based on the key indicators of the enterprise; 2. Compiles a maintenance budget based on the goals and resources of the enterprise; 3. Determines the objective parameters of the functioning of the strategy so as to enable the measuring and assessment of values; 4. Organises the analysis of the criticalness of equipment based on the methodology;	

5. Chooses the appropriate parameters for identifying a failure of equipment, using the IPF curve; 6. Organises the compilation of standard work orders; 7. Leads the maintenance team and organises supervision (equipment, documentation and employees); 8. Compiles expert reports in the field of equipment maintenance using the appropriate methodology; 9. Identifies and analyses the root causes of equipment failures.

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	24-08112018-1.1.3/6k
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)	8
C.2 Occupational title in foreign language	
English:	Authorised Mechanical Engineer, EstQF Level 8
English:	Chartered Mechanical Engineer, EstQF Level 8
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	