

Robotics Specialist

A Robotics Specialist in the automotive sector is responsible for designing, programming, integrating, and maintaining robotic systems that automate key processes such as welding, assembly, painting, and quality inspection. These professionals work at the intersection of mechanical engineering, electronics, and software, ensuring robots perform with precision, consistency, and safety. They configure hardware and software components, calibrate sensors, write control algorithms, and validate simulation models before deployment.

Core responsibilities include optimizing robotic operations for increased throughput, reducing downtime, and ensuring compliance with safety standards. Robotics Specialists collaborate with cross-functional teams—engineers, technicians, and IT staff—to develop reliable, innovative, and adaptable robotic applications. They also provide support for system troubleshooting and continuously improve robotic efficiency and integration across production workflows.

Their role is crucial to meeting the growing demand for quality, customisation, and sustainability in automotive manufacturing.

ESCO Mapping

<https://esco.ec.europa.eu/select-language?destination=/node/1>

ID	NAME	Concept URI
3119.2.1	Robotics engineering technician	https://esco.ec.europa.eu/en/classification/occupation?uri=http%3A%2F%2Fdata.europa.eu%2Fesco%2Foccupation%2F7833d5cd-873d-4fdd-b2f8-9762d68494a7

Context

EQF Level	5-6
Departments	Production Maintenance R&D (Research and Development)

Green Competences

ID	Name	Type	Description	Level	ESCO
C0 01	Energy-efficient automation	Knowledge	Explain strategies and technologies to reduce energy consumption in robotic manufacturing systems. ▪ Identify low-energy robotic components and systems. ▪ Describe the role of regenerative drives and energy recovery. ▪ Compare energy profiles of different motion paths. ▪ Evaluate the impact of idle-time reduction and smart scheduling.	2	Link
C0 02	Monitor and optimise energy use	Skill	Monitor and analyse energy use data to improve robotic process efficiency. ▪ Use software tools to track power usage in robotic workcells. ▪ Interpret energy audit data for process improvement. ▪ Recommend adjustments to reduce consumption without compromising performance. ▪ Collaborate with energy managers to implement energy-saving measures.	3	

Digital Competences

ID	Name	Type	Description	Level	ESCO
C0 49	Robotics programming	Knowledge	Explain the syntax, structure and application of robotics-specific programming languages (e.g., Python, C++, ROS). ▪ Describe strategies for implementing and optimising robot behaviours through code. ▪ Explain how simulation tools validate robot algorithms. ▪ Apply embedded programming to control robotic components. ▪ Analyse robotic code for bottlenecks and debug accordingly. ▪ Evaluate trends in robotics software to guide development.	3	

ID	Name	Type	Description	Level	ESCO
C0 50	Robotic systems architecture	Knowledge	Explain the design and integration of hardware, software and control components for robotics systems. ▪ Evaluate sensor and actuator choices based on system needs. ▪ Describe communication protocols used between subsystems. ▪ Identify common system faults and diagnostic approaches. ▪ Analyse data from robotic operations to guide improvements. ▪ Address safety and design constraints in system development.	2	
C0 51	Integrate robotic systems	Skill	Coordinate and implement the integration of robotic hardware and software for seamless functionality. ▪ Implement communication protocols between robotic subsystems. ▪ Customise configurations for different operational needs. ▪ Test and validate integrated robotic systems. ▪ Resolve conflicts and troubleshoot integration issues. ▪ Collaborate with engineers and developers for effective implementation.	2	
C0 52	Control systems	Knowledge	Explain the principles of real-time control algorithms used in robotics to ensure precision and system stability. ▪ Describe how controllers are programmed and tuned. ▪ Integrate sensors and actuators into feedback loops. ▪ Formulate control strategies for trajectory and motion. ▪ Analyse system dynamics and adjust control logic. ▪ Address reliability concerns through control performance data.	3	Link
C0 53	Robotic algorithms	Knowledge	Explain the function and optimisation of algorithms in robotic applications, including path planning and adaptive control. ▪ Describe how AI/ML methods enhance robot adaptability.	3	Link

ID	Name	Type	Description	Level	ESCO
			▪ Evaluate algorithm performance in simulation and real-world tests. ▪ Analyse inefficiencies in algorithm outputs. ▪ Align algorithm design with robotic system architecture. ▪ Recognise key trends in algorithmic development for robotics.		
C0 54	Simulation tools	Knowledge	Describe the use of simulation environments (e.g., Gazebo, MATLAB, V-REP) for virtual modelling and testing of robotic systems. ▪ Predict robot performance and validate system design virtually. ▪ Integrate sensor data into simulation environments. ▪ Analyse and interpret simulation results. ▪ Troubleshoot simulations to ensure fidelity with physical systems. ▪ Evaluate new simulation technologies for design optimisation.	2	
C0 55	Integrate and calibrate sensors	Skill	Select, integrate and calibrate sensors to enable robotic perception and interaction with the environment. ▪ Integrate LiDAR, cameras and IMUs for robotic awareness. ▪ Calibrate sensors for accurate data acquisition. ▪ Process sensor inputs for real-time decision-making. ▪ Troubleshoot sensor failures and performance issues. ▪ Monitor emerging sensor innovations relevant to robotics.	2	

Soft Skills

ID	Name	Type	Description	Level	ESCO
C1 23	Collaborate in teams	Skill	Work effectively in cross-functional teams, sharing knowledge and supporting collective goals. ▪ Collaborate with engineers, programmers and production teams.	2	Link

ID	Name	Type	Description	Level	ESCO
			▪ Share technical findings and documentation. ▪ Participate in collaborative problem-solving. ▪ Adapt communication styles for diverse team members.		
C1 24	Communicate technical concepts	Skill	Convey technical concepts and results clearly to varied audiences. ▪ Present robotic solutions in meetings. ▪ Explain complex algorithms to non-specialists. ▪ Document software and hardware updates. ▪ Respond clearly to stakeholder queries.	2	Link
C1 25	Adapt to evolving technologies	Skill	Adjust approaches and tools in response to evolving technologies and requirements. ▪ Learn and apply new robotics frameworks. ▪ Shift between simulation and real-world tasks. ▪ Integrate new sensors or components into existing systems. ▪ Respond to unexpected system behaviour.	2	Link
C1 26	Innovate robotic solutions	Skill	Generate and apply creative ideas to develop or improve robotic systems. ▪ Propose novel approaches to optimise robotic motion or path planning. ▪ Contribute to design improvements for robotic workcells. ▪ Adapt existing technologies for new robotic tasks. ▪ Incorporate user feedback to refine robotic functionalities.	3	Link

Transversal Competences

ID	Name	Type	Description	Level	ESCO
C1 64	Solve technical problems	Skill	Identify and address technical challenges using systematic approaches. ▪ Diagnose root causes in robotic malfunctions. ▪ Compare solutions across programming and hardware domains.	3	Link

ID	Name	Type	Description	Level	ESCO
			▪ Use troubleshooting protocols for faster resolution. ▪ Evaluate the impact of proposed fixes.		
C1 65	Apply critical thinking	Skill	Evaluate alternatives logically before making technical decisions. ▪ Assess design trade-offs in system architecture. ▪ Evaluate sensor compatibility and performance. ▪ Reflect on testing outcomes to refine code or hardware. ▪ Propose justified process improvements.	3	Link
C1 66	Safety compliance	Knowledge	Describe safety regulations and operational guidelines related to industrial robotics. ▪ Identify risks related to robotic motion and work cells. ▪ Describe lockout/tagout procedures. ▪ Comply with ISO 10218 and RIA standards. ▪ Monitor adherence to safety zones and protocols.	2	Link
C1 67	Pursue continuous learning	Skill	Actively seek opportunities to acquire and apply new knowledge and skills. ▪ Update technical knowledge on emerging robotics platforms. ▪ Participate in advanced training or certifications. ▪ Reflect on failures to guide learning. ▪ Use feedback to improve performance.	2	Link

Sector-Specific Competences

ID	Name	Type	Description	Level	ESCO
C2 20	Use CAD tools for robotic design	Skill	Use computer-aided design (CAD) software to create and simulate robotic components and systems. ▪ Create 2D/3D models of robotic parts and assemblies. ▪ Simulate motion paths and workspace reach. ▪ Modify designs to fit spatial or mechanical constraints.	2	Link

ID	Name	Type	Description	Level	ESCO
			Export files for prototyping or simulation tools.		
C2 21	Actuator technologies	Knowledge	Describe the types, functions and integration of actuators in robotic systems. - Identify linear, rotary, pneumatic and electric actuators. - Explain actuator response times and torque characteristics. - Describe actuator control methods. - Select actuators based on task requirements.	2	Link
C2 29	Electricity principles	Knowledge	Fundamental electrical theories and applications relevant to robotics and automation systems. - Explain current, voltage, and resistance relationships - Identify electrical components in robotic control systems - Interpret wiring and safety diagrams - Apply safe working procedures for electrical circuits	3	Link
C2 22	Industrial automation	Knowledge	Explain principles of automated production systems and PLCs in manufacturing. - Describe how PLCs interface with robotic units. - Explain industrial communication networks. - Analyse production flow for robotic integration. - Evaluate system flexibility for automation scaling.	2	Link
C2 23	Install and test robots	Skill	Install, configure and test robotic equipment in production environments. - Follow standard setup procedures. - Calibrate robotic arms and tools. - Validate system readiness before operation. - Document test results and deviations.	2	
C2 24	Maintain robotic systems	Skill	Perform preventive and corrective maintenance on robotic systems. - Identify component wear and need for replacement. - Apply scheduled maintenance routines.	2	Link

ID	Name	Type	Description	Level	ESCO
			▪ Perform software updates and backups. ▪ Record maintenance history and diagnostics.		
C2 25	Welding automation systems	Knowledge	Describe principles and control of robotic welding systems. ▪ Identify key components of automated welding cells. ▪ Describe welding parameters and their effects. ▪ Explain safety requirements in robotic welding. ▪ Compare techniques for different materials.	2	Link
C2 26	Human-robot collaboration	Knowledge	Describe principles, constraints and standards for safe and efficient collaboration between humans and robots. ▪ Explain the functional differences between industrial robots and cobots. ▪ Describe ISO/TS 15066 requirements and safety zones. ▪ Identify ergonomic and cognitive factors in shared tasks. ▪ Evaluate use cases where human-robot collaboration improves efficiency.	2	