

Predictive Maintenance Engineer

The Predictive Maintenance Engineer plays a key role in the automotive industry by applying advanced analytics, IIoT sensor technologies, and predictive models to anticipate equipment failures and optimise asset performance. Their main activities include collecting and pre-processing machine data, developing and refining failure prediction models, and integrating predictive insights into maintenance workflows. By identifying patterns and anomalies in operational data, they reduce unplanned downtime, extend asset lifecycles, and support cost-efficient maintenance strategies.

Key responsibilities include designing predictive maintenance solutions, managing CMMS/EAM systems, coordinating with engineering and production teams, and implementing reliability-focused improvements. Essential competences span digital skills (data pre-processing, predictive analytics, IIoT, failure modelling), sector-specific expertise (condition monitoring, reliability engineering, project management), green competences (sustainability and safety in maintenance), and soft/transversal abilities (analytical thinking, communication, teamwork, leadership).

ESCO Mapping

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

ID	NAME	Concept URI

Context

EQF Level	7
Departments	Production and Maintenance

ID	Name	Type	Description	Level	ESCO
C01 1	Sustainability and safety in maintenance	Knowledge	Apply environmental and occupational safety standards (e.g. ISO 14001, ISO 45001) in predictive maintenance activities. ▪ Monitor and minimise environmental impacts of maintenance operations ▪ Apply ISO standards to plan and execute safe interventions ▪ Participate in audits, risk assessments, and emergency planning ▪ Ensure predictive practices comply with HSE regulations ▪ Promote a safety culture within predictive projects	3	
C01 2	Optimise energy-efficient predictive maintenance	Skill	Use predictive insights to optimise energy consumption and improve efficiency of assets and systems. ▪ Analyse energy data from IIoT sensors to identify inefficiencies ▪ Recommend predictive interventions to reduce waste ▪ Configure predictive models to support energy-saving strategies ▪ Monitor improvements in energy KPIs after interventions ▪ Support corporate energy efficiency goals through predictive practices	3	
C00 9	Sustainable asset lifecycle management	Knowledge	Understand how predictive maintenance contributes to extending equipment lifecycle and supporting circular economy goals. ▪ Explain how predictive actions reduce premature replacements ▪ Recommend repair or refurbishment strategies over replacement ▪ Identify recycling and reuse opportunities in predictive contexts ▪ Support planning of sustainable spare parts usage ▪ Promote eco-innovation in maintenance projects	2	

ID	Name	Type	Description	Level	ESCO
C069	Perform data pre-processing and feature engineering	Skill	Prepare and transform raw machine and sensor data to improve predictive model accuracy and reliability. ▪ Clean and preprocess raw data to remove outliers and noise ▪ Handle missing values and normalise datasets ▪ Engineer relevant features from sensor data ▪ Analyse data patterns to identify critical variables ▪ Optimise input data pipelines for predictive algorithms	3	
C070	IoT sensors	Knowledge	Understand the installation, configuration, and monitoring of IIoT sensors for predictive maintenance applications. ▪ Describe installation and calibration procedures for IIoT sensors ▪ Monitor sensor performance to ensure data accuracy ▪ Troubleshoot issues affecting data quality ▪ Analyse integration of sensors with predictive platforms ▪ Interpret sensor data trends to forecast failures	3	
C071	Failure prediction models	Knowledge	Understand the design, training, and refinement of predictive failure models using historical and real-time data. ▪ Explain methods for training and fine-tuning machine learning models ▪ Interpret model outputs to identify high-risk components ▪ Evaluate predictive accuracy against operational outcomes ▪ Update models with new data for continuous improvement ▪ Collaborate with teams to embed models in maintenance strategies	3	
C072	Predictive analytics	Knowledge	Apply predictive analytics techniques to optimise maintenance scheduling and decision-making.	3	

ID	Name	Type	Description	Level	ESCO
			▪ Use historical data and advanced algorithms to forecast equipment performance ▪ Interpret predictive insights to recommend proactive strategies ▪ Continuously refine models with new operational data ▪ Collaborate with cross-functional teams to integrate predictive insights into maintenance planning ▪ Communicate outcomes clearly to support decision-making		
C073	Maintenance management software	Knowledge	Use CMMS/EAM software to manage predictive maintenance tasks, schedules, and asset performance data. ▪ Describe key functionalities of CMMS/EAM platforms ▪ Integrate predictive insights into maintenance management systems ▪ Analyse maintenance history to identify trends and optimise plans ▪ Train colleagues in effective use of software ▪ Ensure proper configuration and upkeep of systems	2	

Soft Skills

ID	Name	Type	Description	Level	ESCO
C127	Communication	Knowledge	Apply effective communication strategies to explain predictive insights and align maintenance goals. ▪ Present predictive results to management and non-technical staff clearly ▪ Facilitate meetings to align predictive strategies with operations ▪ Write detailed reports on predictive findings ▪ Adapt communication style to diverse audiences ▪ Provide regular updates on performance and maintenance plans	2	Link

ID	Name	Type	Description	Level	ESCO
C128	Work in teams	Skill	Collaborate with multidisciplinary teams to integrate predictive solutions effectively. ▪ Work with engineers, operators, and IT staff to embed predictive maintenance ▪ Share knowledge and assist team members during troubleshooting ▪ Contribute to brainstorming sessions for process improvement ▪ Support cooperative problem-solving across teams ▪ Promote a collaborative working environment	2	Link
C129	Solve problems	Skill	Analyse complex data and maintenance scenarios to identify and implement effective solutions. ▪ Investigate root causes of predictive model inaccuracies ▪ Troubleshoot data or sensor anomalies ▪ Propose solutions to reduce unplanned downtime ▪ Implement corrective measures in predictive strategies ▪ Refine approaches through continuous feedback	2	Link
C130	Attention to detail	Knowledge	Ensure accuracy in data analysis, model validation, and predictive reporting. ▪ Verify accuracy of predictive model inputs and outputs ▪ Detect small anomalies in datasets that may indicate failures ▪ Maintain precise documentation of predictive tasks ▪ Review results carefully before reporting ▪ Uphold integrity of predictive processes	2	Link
C137	Apply analytical thinking	Skill	Apply critical and analytical thinking to evaluate predictive models and maintenance strategies. ▪ Analyse large datasets for trends and anomalies ▪ Break down complex problems into actionable steps ▪ Evaluate predictive model performance	3	Link

ID	Name	Type	Description	Level	ESCO
			▪ Interpret sensor and operational data for decision-making ▪ Recommend strategies based on analytical insights		
C138	Manage teams and competences	Skill	Coordinate and develop maintenance teams to strengthen predictive capabilities. ▪ Assign predictive maintenance tasks according to skills ▪ Monitor team performance and provide feedback ▪ Identify skill gaps and training needs ▪ Promote cross-functional knowledge sharing ▪ Support career development initiatives	3	
C123	Collaborate in teams	Skill	Work closely with internal and external partners to implement predictive maintenance strategies. ▪ Collaborate with data scientists to refine predictive models ▪ Align predictive activities with organisational goals ▪ Coordinate with suppliers and service providers for new technologies ▪ Share predictive insights across departments ▪ Foster cooperative relationships for continuous improvement	2	Link

Transversal Competences

ID	Name	Type	Description	Level	ESCO
C173	Perform statistical analysis and interpretation	Skill	Apply statistical methods to analyse large datasets, interpret trends, and support predictive decision-making. ▪ Apply statistical tests (e.g. regression, correlation, ANOVA) to detect trends in equipment data ▪ Interpret variability in sensor signals to identify anomalies ▪ Use statistical models to forecast maintenance needs	3	

ID	Name	Type	Description	Level	ESCO
			▪ Communicate findings to engineers and managers for decision-making ▪ Refine statistical approaches based on new operational data		

Sector Specific

ID	Name	Type	Description	Level	ESCO
C23 6	Condition monitoring tools	Knowledge	Understand and use condition monitoring tools to continuously assess equipment health. ▪ Set up and calibrate vibration, acoustic, and thermographic instruments ▪ Analyse condition monitoring data for early fault detection ▪ Integrate condition monitoring outputs into predictive platforms ▪ Perform regular calibration of monitoring tools ▪ Ensure accuracy and reliability of collected data Integrate monitoring results with predictive maintenance platforms	3	
C23 7	Apply reliability engineering	Skill	Apply reliability engineering principles to enhance long-term equipment performance. ▪ Conduct root cause analysis of failures ▪ Use reliability models to predict equipment behaviour ▪ Recommend design or process improvements to increase reliability ▪ Develop maintenance strategies that balance risk, cost, and performance ▪ Collaborate with engineering teams to implement reliability improvements	3	
C23 8	Optimise maintenance	Skill	Use predictive data to optimise maintenance intervals, schedules, and resource allocation. ▪ Analyse maintenance performance data to identify optimisation opportunities ▪ Apply predictive analytics to prioritise interventions	2	

ID	Name	Type	Description	Level	ESCO
			▪ Refine maintenance plans based on failure probabilities ▪ Evaluate impact of optimised schedules on downtime and costs ▪ Collaborate with operations to align optimisation with production targets		
C24 2	Maintenance cost and resource management	Knowledge	Control maintenance budgets and manage resources to improve efficiency. ▪ Monitor cost efficiency of predictive maintenance tasks ▪ Assess service contracts with external providers ▪ Analyse lifecycle costs to support investment decisions ▪ Optimise use of tools and spare parts ▪ Ensure alignment of financial and technical objectives	3	
C24 3	Manage and improve maintenance projects	Skill	Lead predictive maintenance projects and implement continuous improvement initiatives. ▪ Coordinate predictive maintenance projects using Lean or Six Sigma methods ▪ Conduct structured root cause analysis of recurring failures ▪ Implement improvement initiatives and measure their impact ▪ Document best practices and lessons learned ▪ Align project outcomes with organisational goals	3	
C24 4	Manage contracts and procurement	Skill	Manage contracts and suppliers to ensure effective delivery of predictive maintenance services. ▪ Define technical requirements for external services ▪ Evaluate supplier performance based on KPIs ▪ Supervise contract execution and compliance ▪ Coordinate procurement of predictive tools and systems ▪ Monitor logistics of spare parts and outsourced services	3	

ID	Name	Type	Description	Level	ESCO
C24 5	Organisational and economic obligations	Knowledge	Apply organisational and economic reasoning to predictive maintenance strategies. ▪ Perform cost-benefit analyses for predictive maintenance investments ▪ Assess lifecycle costs of assets and interventions ▪ Ensure compliance with organisational and legal frameworks ▪ Justify investments based on economic and operational impact ▪ Support strategic decisions with financial reasoning	3	