

Specification of Competency Standards
for the Manufacturing Technology.
Unit of Competency.

Functional Area - Product Manufacturing

Title	Conduct advanced CNC turning precision and ultra-precision machining, master various machining parameters, to improve quality of mould components
Code	106590L4
Range	This unit of competency is applicable to the process design and development departments and product manufacturing departments / production departments of companies engaged in the tooling industries. Practitioners should be capable to understand the knowledge of advanced CNC turning machining and are able to operate multi-axis CNC lathes and ultra-precision single-point diamond turning machines to perform turning and turning-milling precision and ultra-precision machining
Level	4
Credit	4
Competency	Performance Requirements 1. Understand relevant knowledge of advanced CNC turning precision and ultra-precision machining processes • Understand application of computer-aided manufacturing (CAM) software and input / output interface systems • Understand advanced tool path programming methods for CNC lathes used in turning and milling operations • Understand operation methods and related programming techniques for the fourth axis or above • Understand impact of various parameters in multi-axis CNC lathes on turning / milling performance and finished products • Understand characteristics and usage of various tool setters • Understand functions, structures, types, and safety precautions of special tools and tool carriers • Understand types and applications of advanced standard fixtures • Understand functions of various cutting fluids and their applications in turning/milling and multi-axis turning operations • Understand methods for handling metal chips • Understand relationship between different machining parameters and tool life • Understand methods and techniques for calibrating and correcting accuracy of multi-axis CNC lathes • Understand types, structures, applications, and operating principles of ultra-precision lathes, including single-point diamond turning machines • Understand environmental requirements for ultra-precision turning, including constant temperature range, humidity control, and cleanliness standards • Understand tool requirements, types, preventive maintenance, and maintenance methods for ultra-precision turning • Understand setting and optimisation methods for various parameters in ultra-precision machining • Understand methods for handling and controlling dust and chips generated in ultra-precision machining • Understand intelligent solutions applicable to multi-axis CNC lathes, including data collection, data organisation, and predictive maintenance

	2. Conduct advanced CNC turning precision and ultra-precision machining • Able to prepare turning / milling programs using CAM software based on the requirements of finished products • Able to use various measuring instruments to measure finished products, including optical measuring instruments and interferometers • Able to calculate and set suitable parameters for turning / milling, multi-axis turning, and ultra-precision machining, including feed step and cutting speed, to optimise machining efficiency • Able to set up and use a tool setter for automatic tool path correction • Able to manage and select cutting tools for multi-axis and turning-milling CNC lathes, and set or modify tool life data • Able to perform multi-axis CNC precision turning/milling machining in accordance with engineering drawings • Able to use the fourth and fifth axes of the multi-axis CNC lathe according to machining requirements • Able to select appropriate single-point diamond cutting tools or other tools to perform ultra-precision turning machining • Able to perform preventive maintenance and maintenance on ultra-precision machining equipment and tools • Able to design and manufacture specific fixtures according to instructions and different requirements • Able to apply simulation programs to verify the feasibility and applicability of turning / milling programs • Able to extend tool life by using suitable machining parameters • Able to estimate machining time based on various machining conditions, including drawings, tool movement, and turning / milling parameters • Able to process and Analyse data collected from multi-axis CNC lathes to evaluate turning quality and equipment performance, and adjust production parameters in real-time to optimise production • Able to extract production data from the PLC or external sensors of the manufacturing equipment 3. Professional handling of advanced CNC turning precision and ultra-precision machining • Able to follow the safety guidelines (including the handling of metal chips generated during turning / milling, multi-axis turning, and ultra-precision machining) and relevant procedures, and perform CNC precision turning machining in accordance with design drawings, specifications, and production efficiency requirements
Assessment Criteria	The integrated outcome requirements of this unit of competency are: • Able to write complex CNC turning / milling, multi-axis turning, and ultra-precision turning programs, and perform multi-axis CNC precision turning / milling and ultra-precision machining on complex parts • Able to perform precision turning / milling and multi-axis turning machining on complex components and finished products, and use appropriate parameters to extend tool life • Able to perform ultra-precision turning machining on components and products with micrometer and nanometer-level accuracy, and maintain the machine tools and cutting tools
Remark	This is the updated version of UoC 106590L5 Individuals who possess the above knowledge and competency are also required to possess the knowledge and competency of “ Perform advanced CNC turning and master various machining parameters to improve quality of mould components (106510L3) ”