

Autodesk Expert in CAM for Multi-Axis Milling

Target Audience

This course is designed for highly experienced CNC programmers, advanced manufacturing professionals, and expert-level CAM users who work with multi-axis milling using Autodesk Fusion 360. It is ideal for professionals in aerospace, defense, medical, industrial design, automotive, and energy sectors who want to demonstrate leadership in advanced manufacturing and validate expert-level toolpath control, simulation, and output optimization for complex machining operations.

Course Objective

The course aims to develop expert-level knowledge in multi-axis CAM programming. It prepares learners to handle complex part geometries, optimize multi-axis toolpaths, simulate realistic machine motion, troubleshoot NC code, and conduct in-process inspection using Autodesk Fusion 360's advanced manufacturing environment.

Course Outcome

- **Advanced Toolpath Planning** – Gain mastery in selecting and refining toolpath strategies for 3+1, 3+2, and simultaneous 5-axis machining.
- **Complex Fixture and Setup Management** – Learn to define workholding, WCS location, and machine configurations for multi-axis environments.
- **Simulation and Collision Validation** – Verify tool clearance, avoid shaft-holder collisions, and simulate operations prior to code generation.
- **Custom NC Code Output** – Generate, troubleshoot, and verify output code for high-precision multi-axis setups.
- **Integrated Inspection Skills** – Validate part accuracy through probing and manual inspection strategies.

Course Outline: The course comprises **40 hours** of in-depth training **theory and practical labs** and is divided into **6** comprehensive chapters. Each chapter includes advanced hands-on labs, simulation tasks, and case-based toolpath exercises.

Chapter 1. Planning and Setup for Multi-Axis Machining

- Interpreting engineering drawings for multi-axis operation
- Planning stock preparation for multi-axis work holding
- Designing fixtures and evaluating cutting forces
- Analyzing geometry for toolpath sequencing
- Assessing if multi-axis machining is suitable
- Performing multi-axis CAM setup in Fusion 360
- Locating the Work Coordinate System (WCS) for center of rotation
- Creating machine configurations for multi-axis environments

Chapter 2. Machine and Tool Setup

- Digitally planning tool assemblies and holders
- Selecting tools and holders for specific geometry
- Digitally assembling work holding devices
- Choosing work holding based on part specifications
- Defining multi-axis work offsets and operation parameters
- Establishing WCS strategies for multi-fixture setups

Chapter 3. Programming Multi-Axis Toolpaths

- Choosing machining strategies for complex geometry
- Selecting appropriate toolpaths (e.g., swarf, steep and shallow)
- Defining tool orientation for 3+1, 3+2, and simultaneous 5-axis
- Managing axis of rotation and tilt angles
- Creating wrapped 2D toolpaths using tool axis control
- Defining containment boundaries using edges, sketches, surfaces
- Controlling toolpath slope limits and retraction policies
- Applying collision avoidance with shaft and holder controls
- Trimming toolpaths and adjusting movement strategies
- Optimizing program order and toolpath smoothing

Chapter 4. Simulation and Verification

- Simulating toolpaths with machine motion
- Validating stock removal strategies using comparison tools
- Detecting tool collisions and holder interference
- Making toolpath adjustments based on simulation outcomes

Chapter 5. NC Code Output

- Verifying axis setup with posted NC code
- Troubleshooting NC code errors
- Configuring output to match machine capabilities

Chapter 6. In-Process Part Inspection

- Using probing cycles to verify features and dimensions
- Manually inspecting part dimensions and feature tolerances
- Updating machine parameters based on inspection results
- Proving out programs on a physical machine