

COURSE MODULES

Module	Name
Intro — Mastercam	Introduction to Multiaxis
1	Multiaxis Control
2	Positional Multiaxis Toolpaths
3	Simultaneous Multiaxis Toolpaths
4	Multiaxis Application

1 — MULTIAXIS CONTROL

Competency	Objective	Cognitive	Importance	Difficulty
MA1.1 — The student will describe multiaxis control options to manipulate the tool path to achieve positive verification.				
	MA1.1.1 — The student will describe 2 cut patterns using 3D curves and surfaces to drive five axis toolpaths.	1	2	1
	MA1.1.2 — The student will describe tool axis control options with lines, surfaces, and points to orient the tool's center axis.	1	2	1
	MA 1.1.3 — The student will describe collision controls via check/drive surfaces to avoid collisions.	1	2	1
	MA 1.1.4 — The student will describe tool tip control using surfaces and curves to compensate to correct depth.	1	2	1

2 — POSITIONAL MULTIAXIS TOOLPATHS

Competency	Objective	Cognitive	Importance	Difficulty
MA 1.2a — The student will modify machine definition and control definition to change post output.				
	MA 1.2a.1 — The student will modify machine definition options to correct an error in post output.	3	2	2
	MA 1.2a.2 — The student will modify control definition parameters and verify changes in post output.	3	2	3
MA 1.2b — The student will create Work Coordinate System (WCS) and tool/construction planes for accurate tool positioning.				
	MA 1.2b.1 — The student will program tool planes accurate to machine type.	3	3	2
	MA 1.2b.2 — The student will create dynamic planes, and automate plane creation through the use of relative planes.	2	2	1
MA 1.2d - The student will program 2-dimensional toolpaths for 4-axis output using axis substitution.				
	MA 1.2d.1 — The student will program a 2D contour toolpath to revolve around a cylinder using axis substitution.	3	2	3
	MA 1.2d.2 — The student will program the unroll feature within axis substitution to output a 4-axis drilling operation.	3	2	3

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3 — SIMULTANEOUS MULTIAXIS TOOLPATHS

Competency	Objective	Cognitive	Importance	Difficulty
MA 1.3a — The student will program simultaneous 5-axis pattern toolpaths using unique combinations of cut pattern, tool axis, tool tip, and collision controls.				
	MA 1.3a.1 — The student will program a 5-axis curve operation that follows a 3D curve for cut pattern and uses lines for tool axis control.	3	2	3
	MA 1.3a.2 — The student will program a 5-axis swarf milling toolpath using floor surfaces and guide curves.	3	2	3
	MA 1.3a.3 — The student will program a 5-axis curve operation using curves for cut pattern, chain for tool axis control, and surfaces for collision control.	3	2	3
	MA 1.3a.4 — The student will program a 5-axis curve operation using curves for cut pattern, chain for tool axis control, and surfaces for collision control.	3	2	3
	MA 1.3a.5 — The student will program a 5-axis flow operation using points and chains for tool axis control.	3	2	3
	MA 1.3a.6 — The student will program a 5-axis parallel toolpath using a surface for cut pattern and a chain for tool axis control.	3	2	3
MA 1.3b — The student will program simultaneous 5-axis application toolpaths using unique combinations of cut pattern, tool axis, tool tip, and collision controls.				
	MA 1.3b.1 — The student will program a 5-axis deburr toolpath using a lollipop mill to deburr tops and bottoms of holes on 5 sides of a part.	3	2	3
	MA 1.3b.2 — The student will program a 5-axis project curve toolpath to follow geometry projected along a surface.	3	2	3

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	MA 1.3b.3 — The student will program a 3+2 automatic roughing toolpath to remove material at multiple planes in a single operation.	3	2	3
	MA 1.3b.4 — The student will program a 5-axis drilling operation to drill holes at multiple planes in a single operation.	3	2	3

4 — MULTIAXIS APPLICATION

Competency	Objective	Cognitive	Importance	Difficulty
MA 1.4a — The student will generate toolpaths and verify results in simulation and post output.				
	MA 1.4a.1 — The student will define fixtures, stock, and machine in simulation options to verify collision and machined model accuracy.	3	2	3
	MA 1.4a.2 — The student will verify accuracy of post data as compared to machine control by analysis of post output.	2	2	3
MA 1.4b — The student will program advanced features in multiaxis toolpaths for trimming and correcting undesirable tool motion.				
	MA 1.4b.1 — The student will define stock within a multiaxis toolpath to trim the toolpath to a specific area.	3	2	3
	MA 1.4b.2 — The student will program approximate and exact modes and understand the differences in calculation method.	3	2	3
	MA 1.4b.3 — The student will program collision control tolerancing layered on top of cut pattern tolerancing.	3	2	3