Mastercam U®

Advanced Mill Design and Toolpaths

Course Description

The Mastercam University® Advanced Mill Design & Toolpaths course covers many different ways to create and machine 3D geometry, including an extensive 4th axis module. The first module teaches many different surface creation methods fundamental to a well-rounded CAD/CAM background. The second module is an overview of 3D machining strategies. In this lesson you apply many different machining strategies to similar geometry, seeing first hand the strengths as well as best application of each of the 3D high speed toolpaths. In the third module you put all of the previous lessons into practice by creating programs similar to parts in your shop, including fixturing. The fourth module covers 4-axis machining with lessons on axis substitution, axis positioning, and radial and rotary axis machining. This module prepares you for 5-axis machining.

Course Objectives

Upon completion, you should be able to demonstrate skill in the following areas:

Advanced Wireframe Creation

- Creating tangent vectors relative to a surface edge or point on a surface
- 2D and 3D spline creation and manipulation
- Multiple construction planes
- User-defined construction planes
- 2D and 3D construction methods

Surface/Solid Modeling

- Surface Normal
- Surface geometry creation
- Application of all Mastercam surface creation functions
- Projecting geometry onto surfaces
- Advanced solids

Application of Mastercam Solid Creation

- Fillet/Chamfer
- Boolean operations
- Loft solid
- Swept solid
- Shell solid
- Thin Wall solids
- Trim a solid with a surface

Toolpath Overview

- Overview high speed toolpaths
- Core Roughing toolpath
- Setup for the core
- Horizontal Flat Boundary toolpath
- Rest Roughing toolpath
- Raster toolpath
- Scallop toolpath
- Waterline toolpath
- Spiral toolpath
- Radial toolpath
- Pencil toolpath
- Translate a Raster boundary toolpath
- Setup for the core
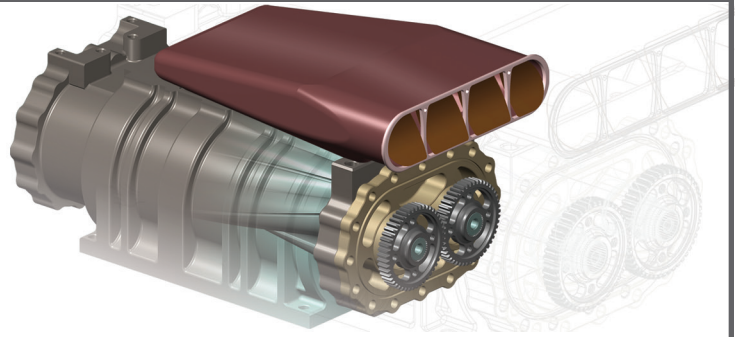- Blend toolpath
- Rough Cavity toolpath

Toolpaths

- Efficient toolpath creation
- Scale the model for Shrink
- Creating core geometry, Boolean remove
- Set WCS, stock size, tool list
- Area Rough, Rest Rough
- Backplot, Quick Verify
- STL file creation and STL compare
- Stock setup
- Spiral finishing
- Selecting distance 2D vs. 3D

Toolpaths (continued)

- Waterline
- Pocket contain boundary
- Z depth/height control
- Toolpath transformation
- Ghosting operations
- Select core levels
- Determine stock boundary
- Core vs. Cavity machining strategies
- Selecting geometry by color
- Scallop toolpath
- Flowline toolpath
- Blend toolpath

4th Axis/Rotary

- Axis substitution
- Unwrapping the cylinder
- Defining the cylinder for stock
- Drilling the radial holes
- Axis indexing
- Creating WCS planes form a solid
- Using the WCS offset for depth
- 4th axis machining
- Holding the part
- Creating solids for fixturing
- Multiaxis rotary 4th axis toolpath
- Radial cut
- Lead lag angle
- Roughing with an axial cut

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Materials

The Advanced Mill Design & Toolpaths course requires:

- High speed internet connection.
- Computer that meets the Mastercam System Requirements.
- Mastercam Demo/Home Learning Edition, which you can download at Mastercam U.

Course Schedule

Because this course is available online, it can be taken at any time and at your own pace. At an educational institution, this course would typically require approximately sixty hours. This includes lab time to complete all examples. To get the most out of this class, plan to spend three hours per session and allow two and a half hours to take the final practical test.

Multiple Choice Test Overview

There are multiple choice assessments for both the beginning and end of the design and toolpath sections of the course. You will receive a Certificate of Completion (PDF format) upon completion of the posttest, which will display the posttest grade. Students should have at least 30-45 minutes to complete the multiple choice question tests. These are supplied to review.

Course Policies

- This course is designed for one student, but allows the lectures to be viewed by others.
- The Certificate of Completion will be stored at Mastercam University under your unique student ID number. It remains available for you to use as proof of work completed and grades received.
- You must also register at participating colleges to receive credit for the successful completion of this course.