



CAM for 2.5 Axis Milling Certification Prep - Associate

Instructor guide

Course duration: ~700 minutes

Level: Intermediate

Product: Autodesk® Fusion 360®

This instructor guide is a comprehensive tool for facilitating this in the classroom. Prepare to teach this course by thoroughly reviewing this document, as well as all related course materials and resources.

We've summarized the core Fusion 360 skills in CAM for 2.5 Axis Milling Certification Prep course so you can familiarize yourself with them before delivering this learning content in the classroom. It's always recommended that you work through the course yourself in preparation for each lesson.

Learning objectives:

- Process plan a 2.5-axis required part.
- Create and manage a digital tool library.
- Use 2.5-axis toolpaths to rough a part.
- Use 2.5-axis finishing techniques to finish a part.
- Use Simulation to validate stock removal.
- Create required documentation and output.

Each module is listed below along with suggested time allocations for instruction. The referenced demonstrations are based on the step-by-step instruction included in the course. Review the video tutorials and step-by-step print guides for the detailed instruction in each module.

This course teaches several topics covered in the [Autodesk Certified Associate CAM for 2.5 Axis Milling](#) certification exam. We've included relevant certification exam objectives covered within each module.

Getting started

Total time required for module: 20 minutes

Discuss objectives: 3 minutes

Demonstrate: 10 minutes

- Review course overview and learning objectives
- Download the course resources and software
- Create an Autodesk ID
- Install the software
- Review the starter activity and articles

Hands-on time: 5 minutes

Review objectives: 2 minutes

Datasets:

Assignments:

Manufacturing Process Planning for CNC Milling

Total time required: 120 minutes

Discuss objectives: 3 minutes

Demonstrate: 15 minutes

- Review a detailed drawing.
- Identify workholding devices.
- Select applicable tools.
- Create a process plan.

Hands-on time: 40 minutes

Review objectives: 2 minutes

Certification exam objectives:

- 1.1.1 Identify and Explain GD&T Symbols
- 1.1.2 Identify required tool type, size, and projection
- 1.1.3 Identify required surface finish
- 1.1.4 Identify tolerance-controlled features
- 1.2.1 Identify and select an appropriate CNC machine
- 1.2.2 Identify or define workholding device requirements
- 1.3.1 Identify and source applicable tools for manufacture
- 1.3.2 Identify and source tool holders for manufacture

Datasets:

Dual Fixture Plate – 1001 Drawing.pdf
Dual Fixture Plate - 1001.f3d
Process Plan Sample.xls

Assignments:

- **Practice exercise:** 15 minutes
 - Exhaust flange.f3d
 - Process Plan Practice.xls
- **Challenge exercise:** 30 minutes
 - fixture.f3d
- **Module quiz:** 15 minutes

- 1.4.1 Calculate appropriate federate and tool speed
- 1.5.1 Classify required machining operations
- 1.5.2 Infer information from a process plan form

CAD Modeling and Model Preparation

Total time required: 135 minutes

Discuss objectives: 3 minutes

Demonstration: 15 minutes

- Create and control sketch entities.
- Create construction planes.
- Create solid and surface features.
- Apply direct modeling tools.
- Create assembly components.
- Apply assembly joints.

Hands-on time: 40 minutes

Review objectives: 2 minutes

Certification exam objectives:

- 2.1.1 Create a new sketch on a plane or planar face
- 2.1.2 Create a new construction plane
- 2.1.3 Edit a sketch
- 2.1.4 Modify sketch display options
- 2.1.5 Apply dimensions to a sketch
- 2.1.6 Apply and remove sketch constraints
- 2.1.7 Link user parameters and sketch dimensions
- 2.1.8 Create user parameters
- 2.1.9 Apply math operators in user parameters
- 2.2.1 Create extrude features using driven height options
- 2.2.2 Create a patch surface
- 2.2.3 Apply fillets and chamfers to a model
- 2.2.4 Split bodies and faces
- 2.3.1 Recognize the application of Press Pull to modify a feature
- 2.3.2 Recognize the application of Move/Copy to move a feature
- 2.3.3 Identify the use of Delete to remove a feature
- 2.4.1 Create a component
- 2.4.2 Apply joints to create motion

Datasets:

Angled Block.f3d
 Locking Fixture.f3d
 Receiver Plate.step
 Wheel Assembly.f3d
 05-0404 – Vise with Hard Jaws.f3d

Assignments:

- **Practice exercise:** 30 minutes
 - baffle.f3d
- **Challenge exercise:** 30 minutes
 - pocket.f3d
- **Module quiz:** 15 minutes

- 2.4.3 Identify the use of Delete to remove a feature
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Create and Simulate CNC Milling Toolpaths

Total time required: 150 minutes

Discuss objectives: 3 minutes

Demonstration: 15 minutes

- Identify complex 3D geometry.
- Use 3D Scallop.
- Use 3D Morphed Spiral.
- Finish a complex part.

Hands-on time: 55 minutes

Review objectives: 2 minutes

Datasets:

CAM Cert prep VMC.tools

Certification exam objectives:

- 3.1.1 Create a digital tool library
- 3.1.2 Create a custom digital tool
- 3.1.3 Copy and modify a digital tool
- 3.1.4 Define tool parameters
- 3.2.1 Define a digital CNC machine
- 3.2.2 Create stock
- 3.2.3 Select a box point to locate a working coordinate system
- 3.2.4 Define a coordinate reference
- 3.3.1 Import a CAD file
- 3.3.2 Locate digital work holding
- 3.4.1 Create a basic pocket toolpath for roughing
- 3.4.2 Create an adaptive toolpath for roughing
- 3.5.1 Create a facing toolpath
- 3.5.2 Create a 2D contour toolpath
- 3.5.3 Create Chamfer and 2D contour chamfer toolpaths
- 3.5.4 Create a drilling and tapping toolpath
- 3.6.1 Simulate a single toolpath
- 3.6.2 Simulate a setup

Mounting Block.f3d

Mounting Block Setup.f3z

Mounting Block w Fixture.f3z

Mounting Block Roughed.f3d

Mounting Block Ready to Sim.f3z

Assignments:

- **Practice exercise:** 30 minutes
 - tray.f3d
- **Challenge exercise:** 30 minutes
 - Jig plate.f3d
 - Orange Vise.f3d
- **Module quiz:** 15 minutes



Create Required Documents to Set Up and Run a CNC Mill

Total time required: 115 minutes

Discuss objectives: 3 minutes

Demonstration: 15 minutes

- Create supporting documentation for CNC milling.
- Export NC code for single and multiple coordinate systems.

Hands-on time: 20 minutes

Certification exam objectives:

- 4.1.1 Create a setup sheet with tool list
 - 4.2.1 Export NC Code for a single coordinate system with an appropriate post processor
 - 4.2.2 Export NC Code for multiple coordinate systems
 - 4.2.3 Identify code snippets
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Assignments:

- **Course Assessment:** 45 minutes
- **Course Challenge:** 120 minutes
 - receiver setup1.f3d
 - Orange Vise.f3d

Module: Next steps

Total time required: 30 minutes

Review objectives: 2 minutes

Datasets:

Mounting Block Ready to Post.f3d

Assignments:

- **Practice exercise:** 30 minutes
 - deep pocket.f3d
- **Challenge exercise:** 30 minutes
 - deep pocket.f3d
- **Module quiz:** 15 minutes

Review individual student outcomes for end of course test: 10 minutes

Create a student study plan: 10 minutes

Retest using the end of course test: 5 minutes

Review certification objectives: 5 minutes