Geometric Dimensioning and Tolerancing (GD&T) Using Autodesk Fusion

1. Target Audience

This course is designed for mechanical engineers, CAD designers, product designers, manufacturing engineers, CNC programmers, quality engineers, inspection professionals, tooling engineers, and engineering students who wish to develop proficiency in applying GD&T using Autodesk Fusion. The course covers both ASME Y14.5 and ISO GPS standards and requires a basic understanding of engineering drawings and 3D CAD modeling.

2. Course Outcomes

- Understand GD&T principles and terminology.
- Differentiate conventional dimensioning and GD&T.
- Interpret ASME Y14.5 and ISO GPS drawings.
- Apply datum reference systems.
- Apply form, orientation, location, profile and runout tolerances.
- Create manufacturing drawings in Autodesk Fusion.
- Apply feature control frames and datum symbols.
- Validate drawings for manufacturing and inspection.
- Troubleshoot common GD&T errors.
- Prepare production-ready documentation.

3. Course Objectives

- Develop a comprehensive understanding of GD&T.
- Learn ASME Y14.5 and ISO GPS standards.
- Gain proficiency in Autodesk Fusion Drawing Workspace.
- Apply geometric tolerances to mechanical components.
- Produce professional manufacturing drawings.
- Reinforce concepts through practical exercises.

4. Course Outline

The course comprises approximately 24 hours of instructor-led theory and hands-on laboratory sessions and is divided into six modules. Each module combines conceptual learning with practical demonstrations and exercises using Autodesk Fusion.

5. Table of Contents

Module 1: Introduction to GD&T Fundamentals

Module 2: Datum Systems and Form Controls

- Inspection Methods
- Practical Exercises

Module 3: Orientation, Location, Profile and Runout Controls

- Parallelism
- Perpendicularity
- Angularity
- Position Tolerance
- True Position
- Composite Position
- MMC, LMC, RFS
- ISO Material Modifiers
- Bonus Tolerance
- Virtual Condition
- Profile of a Line
- Profile of a Surface
- Concentricity and Symmetry
- Circular Runout
- Total Runout
- Functional Gaging
- Industrial Applications
- Practical Exercises

Module 4: Autodesk Fusion Drawing Environment

- Drawing Workspace
- User Interface
- Drawing Templates
- ASME and ISO Standards
- Drawing Preferences
- Creating Sheets
- Base Views
- Projected Views
- Auxiliary Views
- Section Views
- Detail Views
- Break Views
- Isometric Views

- Dimensioning
- Baseline and Ordinate Dimensions
- Centerlines and Center Marks
- Annotation Tools
- Practical Exercise

Module 5: Applying GD&T in Autodesk Fusion

- Datum Feature Symbols
- Feature Control Frames
- Form Tolerances
- Orientation Controls
- Position Tolerances
- Profile Controls
- Runout Controls
- Hole and Thread Callouts
- Surface Texture Symbols
- General Tolerances
- Limits and Fits
- Welding Symbols Overview
- Notes and Leaders
- Revision Tables
- Title Blocks
- Drawing Verification
- Exporting PDF and DWG
- Practical Annotation Exercise

Module 6: Industrial Applications and Drawing Validation

- Industrial Drawing Project
- Complete Manufacturing Drawings
- Functional Dimensioning
- Complete GD&T Scheme
- ASME Validation
- ISO Validation
- Tolerance Stack-up
- Design for Manufacturing
- Design for Inspection
- Quality Documentation

- Inspection Planning
- CMM Overview
- GO/NO-GO Gauges
- Drawing Review Checklist
- Common GD&T Errors
- Manufacturing Documentation
- Final Project
- Course Summary

6. Hands-on Laboratory Exercises

- Create engineering drawings from Fusion models.
- Configure ASME and ISO drawing standards.
- Create datum reference systems.
- Apply all major GD&T controls.
- Annotate manufacturing drawings.
- Validate drawings against ASME Y14.5 and ISO GPS.
- Export PDF and DWG documentation.
- Develop a production-ready engineering drawing.