Autodesk Professional in Design for Manufacturing with 3D printing

Target Audience

This course is designed for experienced design engineers, CAD professionals, and manufacturing specialists who want to develop and validate their advanced skills in design for manufacturing using Autodesk Fusion 360. It is ideal for individuals working in aerospace, automotive, mechanical, industrial design, medical, and general manufacturing sectors who aim to bridge the gap between design and production.

Course Objective

This course offers advanced knowledge and practical skills in designing parts and assemblies tailored for diverse manufacturing methods, including subtractive, additive, sheet metal, and molded processes. Participants will gain expertise in creating complex 3D models, managing assemblies, generating detailed technical documentation, and producing high-quality renderings suitable for manufacturing workflows. The course is aligned with the requirements of the Autodesk Certified Professional in Design for Manufacturing certification, enabling learners to validate their capabilities and succeed in real-world design-for-manufacturing environments.

Course Outcome

- Manufacturing-Aware Design Proficiency – Gain expertise in designing for subtractive, additive, molded, and sheet metal manufacturing.

- Advanced 3D Modeling Skills – Master creating complex solid, surface, freeform, and sheet metal parts with parametric control.

- Assembly and Component Management – Learn to create distributed and derived designs, control component behaviours, and manage physical properties.

- Documentation and Presentation Excellence – Develop detailed drawings, exploded views, and professional renderings to communicate design intent clearly.

Course Outline: The course comprises 48 hours of advanced theory and practical labs, divided into 10 comprehensive chapters. Each chapter is followed by hands-on lab exercises to reinforce learning and assess understanding of the topics covered.

Module 1: Introduction to Design for Manufacturing

- Definition and purpose of Design for Manufacturing (DFM)
- Importance of DFM in reducing cost, rework, and production errors
- Relationship between design decisions and manufacturing feasibility
- Overview of manufacturing processes supported in Fusion 360
- Role of a design engineer in production-ready product development

Module 2: Manufacturing-Aware 3D Component Modeling

- Parametric modeling principles for manufacturable designs
- Advanced sketching using constraints, construction geometry, and parameters

Creating and modifying solid features such as extrudes, holes, threads, ribs, and drafts

- Maintaining design intent through feature history and parametric control
- Best practices for revising models based on manufacturing feedback

Module 3: Plastic Part Design for Injection Molding

- Overview of the injection molding process
- Designing for uniform wall thickness
- Applying draft angles for mold release
- Designing ribs, bosses, fillets, and corners for strength and moldability
- Identifying and preventing molding defects such as sink marks and weld lines
- Using draft analysis and section analysis tools in Fusion 360

Module 4: Mold Design Fundamentals (Core, Cavity & Mold Split)

- Understanding mold structure, cores, and cavities
- Identifying mold opening direction and parting lines
- Manual creation of core and cavity bodies
- Performing mold splitting workflows in Fusion 360
- Understanding single-cavity and two-cavity mold concepts
- Conceptual introduction to gates, runners, and ejector systems

Module 5: Design for Additive Manufacturing (3D Printing)

- Overview of additive manufacturing technologies (FDM and SLA)
- Designing parts suitable for 3D printing
- Build orientation and its effect on strength and surface quality
- Reducing support structures through design optimization
- Preparing and exporting STL files from Fusion 360
- Using 3D printing for functional prototyping before final production

Module 6: Warpage, Shrinkage & Manufacturing Defect Control

- Understanding shrinkage behavior in plastic materials
- Causes of warpage in molded and 3D printed parts
- Effect of wall thickness variation on part deformation
- Design strategies to minimize warpage and shrinkage
- Using analysis and section tools in Fusion 360 for validation

Module 7: Design for Subtractive Manufacturing (CNC / CAM)

- Fundamentals of CNC machining processes
- Designing features considering tool accessibility and machining limits
- Feature sizing guidelines for milling and drilling
- Preparing CAD models for CAM workflows in Fusion 360
- Introduction to CAM setups and basic toolpath concepts

Module 8: Prototyping to Production Workflow

- Role of prototyping in design validation
- Comparing additive and subtractive prototyping methods
- Iterating designs based on prototype feedback
- Transitioning designs from prototype to production-ready models
- Manufacturing readiness checks before final release

Module 9: File Organization & Revision Management

- Organizing components and assemblies in Fusion 360
- Managing design versions and revisions
- Naming conventions and documentation standards

- Maintaining traceability of design changes
- Preparing files for collaboration and manufacturing handover

Module 10: Final Manufacturing-Ready Design Project

- End-to-end product design using DFM principles
- Plastic or mechanical part design with manufacturing constraints
- Validation for molding, machining, and 3D printing
- Final manufacturability review using Fusion 360 tools
- Preparing production-ready design files