IFS ACADEMY
Training For The Future!!

(MDDE) – Mechanical Design Domain Engineer

(Duration: 6 Months)

(With 100% Placement Assistance)

About the Course:

IFS Academy has partnered with a leading Engineering Services company to offer the Mechanical Design Domain Engineer (MDDE) Program, focusing on industry-specific skills essential for success in the Mechanical Design domain. This comprehensive course integrates software expertise in CAD/CAM/CAE with hands-on training tailored to meet the demands of the industry. Led by industry veterans with over 20 years of experience and certified software instructors, the program ensures students are equipped with the necessary skills to excel in the field.

Course Curriculum

Chapter 1 - Plastic Design Domain

Duration - 6 Weeks (2 Hours each day)

1. Introduction to plastic

This topic covers what is plastic? how plastics are made? why use of plastic is increasing in almost every industry, design requirement of plastic parts, classifications of plastic.

2. Plastic properties

For any product it is very important to select a right material which can satisfy the function and application requirement and to select the right material, material property knowledge is very important. In this topic we will cover plastic thermal properties, mechanical properties, electrical properties, additives, reinforcement, case studies for right material selection, etc.

3. Plastic moulding processes

This topic covers the different moulding processes like injection moulding, extrusion moulding, blow moulding, gas assisted injection moulding, rotational moulding, compression moulding, thermoforming, structural foam moulding, insert moulding, over-moulding process.

4. Introduction to injection moulding tool

This topic covers the injection moulding process in details including injection moulding machine, its components, feed system, types of gates, cooling system, ejection system, mould construction etc.

5. Sliders and lifters

Knowledge of sliders and lifters in plastic product design is very important and it is having relation with the product structure and cost, manufacturing cost, maintenance cost as undercut in product design requires to use sliders and lifters in the mould which will increase the mould cost and mould complexity.

6. Plastic defects

This topic covers the plastic defects with defects introduction, its causes and remedies to eliminate the defects.

7. Plastic post processes

This topic covers the post processes that can be done on the plastic parts as a secondary operations and what things need to considered while performing secondary operations on

plastic parts like machining, finishing, threading, drilling, sawing, milling, grinding, laser cutting, painting, electroplating, vacuum metalizing, hot stamping, sublimation printing, screen printing etc.

8. Plastic joining methods

This topic covers how we can assemble or join the plastic parts with methods like mechanical fasteners, snap joints, hot gas welding, hot plate welding, laser welding, spin welding, vibration welding, ultrasonic welding, electrofusion welding, induction welding, adhesive bonding, solvent bonding, heat staking etc.

9. Class A surface & surface continuity

This topic covers what is class A surface? Why class A surface is needed? Class A surface modelling process, surface continuities with their significance and guidelines.

10. Design guidelines of plastic part and features

This topic covers the design guidelines to design a functional and manufacturable parts, and it includes the guidelines regarding nominal wall thickness, corrugation, ribs, boss, holes & cut-out, how to provide draft, corner radius and fillets, living hinge, lettering on parts, plastic bearings, plastic gears, guidelines related to assembly feature like snap, dog house, clip tower, locator, heat stakes, fasteners, inserts, etc.

11. Structural design of plastic

This topic covers how we can design a plastic part for different structural cases like design for bending, shear, torsion, stiffness, impact, creep, fatigue and thermal cases.

12. Moldflow analysis

This topic covers the introduction to the moldflow analysis technically including different analysis like filling analysis, packing analysis, shrinkage and warpage analysis, core shift analysis, overmolding analysis, etc

13. Design for manufacturing and assembly (DFMA)

This topic covers how we can design the part for manufacturing and assembly, principles of DFMA, methodology of DFMA, benefits of DFMA, implementation of DFMA with example.

14. CAD Topics

This topic includes understanding of core, cavity, tooling direction, draft direction, draft analysis etc. It also covers how we can make a close volume from the A surface i.e. A to B conversion or close volume creation with uniform thickness and close volume creation with master sections, skin foam tasks, remastering (reverse engineering), assembly feature creation with design guidelines, power copy, etc.

15. Projects

This topic covers the discussion as well practice on CAD projects like headliner project, car door project, console project, cad tests, etc.

Chapter 2 - Sheetmetal Design Domain

Duration: 2 Weeks (2 Hours each day)

1. Introduction to Sheetmetal & Material Selection

In this topic, we will get introduction to sheet-metal and sheet-metal properties and materials for different applications.

2. The shearing process

In this topic, we will study shearing processes, isotropy and anisotropy.

3. The Press-Brake Operations

In this topic, we will learn about spring-back effect, K & Y Factors, Bend Allowance, Bend Deduction and OSSB. We will study all press-brake operation and design guidelines.

4. The stamping operations:

In this topic, we will study stamping operations like blanking, piercing, forming, deep driving, fine blanking, slide blanking, their design considerations, tooling processes along with Forming Limit Diagram (FLD)

5. The Roll Forming Operations

In this topic, we will study roll forming operations, their design guidelines, applications.

6. The Spinning Operation:

In this topic, we will study the spinning operations, design guidelines and applications.

7. The Drill Press Work

In this topic, we will study drill press work operations for sheet-metal.

8. The Deburring & Abrasion

In this topic we will learn about sheet-metal finishing operations and design guidelines.

9. The Joining Operations

In this topic, we will cover all sheet-metal joining operations including welding and riveting and their design guidelines.

10. The Heat Treatment Operations

In this topic, we will study various heat treatment operations and their design guidelines.

11. Plating & Painting

In this topic we will understand design guidelines of plating and painting operations

Chapter 3 - GD&T (Basic & Pro)

Duration: 2 Weeks (2 Hours each day)

1. Introduction to GD&T

This topic covers why we need GD&T, basic geometric characteristic symbols, modifying symbols and introduction to Feature Control Frame (FCF)

2. GD&T – Rules, Definitions and Terms

This topic covers concepts of Feature and Feature of Size, Actual Mating Envelop, Inner and Outer Boundary, Virtual and Resultant conditions which are critical in GD&T applications. We also understand Rule 1 & 2 of GD&T.

3. GD&T - Modifiers

This topic covers 20+ GD&T modifying symbols and their application along with concepts of material conditions like MMC, LMC & RFS.

4. Form Control

This topic covers form controls such as Straightness, Flatness, Circularity and Cylindricity with their interpretation and applications.

5. Planer & Non-Planer Datums

This topic covers planer and non-planer datums, 3-2-1 principle, Datum targets , Bonus tolerance and datum shift concepts and you gain the confidence of how to select the datums for given application.

6. Orientation Control

This topic covers orientation controls like perpendicularity, angularity and parallelism with their interpretation and application.

7. Location Controls

This topic covers Tolerance of Position (TOP) applied to FOS at different material conditions, Composite and Multi-segment Feature Control Frames, Simultaneous and Separate Requirements. This is most widely used control in engineering drawings. We will also study concentricity and symmetry controls and their applications.

8. Profile Control

This topic covers profile control applied to line or surface elements with applications.

9. Case Studies

We will go through real time case studies of GD&T applications.

Chapter 4 - Tolerance Stack-up Analysis (WC | RSS | MRSS Methods)

Duration – 1 week (2 Hours each day)

1. Approaches to finalize tolerance values of dimensions

In this topic we will study 2 main approaches of tolerancing the dimensions.

2. Engineering Fits
In this topic we will cover types and interpretation of engineering fits and their applications.
3. Part and Assembly Stack-up analysis
In this topic we will study how to build dimensional circuit and conduct tolerance stack-up analysis on the part as well as assembly. We will study Worst case and Statistical methods of tolerance stack-up analysis. We will also study Biasing and Assembly Shift concepts.
4. GD&T applications
In this section, you will study the applications and interpretation of GD&T symbols and modifying symbols into Tolerance stack-up analysis.
5. Case Studies
In this sections we will understand many case studies of tolerance stack-up analysis.

Chapter 5 - NPD | NPI Process

Duration – 3 Weeks (2 Hours each day)
1. Phases of NPD | NPI Process – Overview
In this topic, we will study overview of NPD process and how it's different from PLC.
2. Opportunity Exploration and Target Setting
In this topic, we will study tools like QFD to set the design targets. We will study, inputs, tools techniques and outputs of teach phases.
3. Brainstorming and Concept Selection
In this topic we will study brainstorming techniques, tools and techniques and how to select the potential concept.
4. Concept Feasibility
In this topic, we will study how to prove the concept especially in terms of DFX.
5. Design Release
In this topic, we will study how to release the design and change management process.
6. Process Development
In this topic, we will cover how design team works with other departments to develop the released product design.
7. Product & Process Validation
In this topic, we will study how product and process validation is carried out to meet all the requirements including regulatory requirements.
8. Lessons Learned
In this topic we will understand various ways of capturing the learnings from the designs.
9. Systematic Problem Solving
In this topic, we will understand how to solve technical problems in the design using systematic problem solving methods like 8D and A3.
10. Patent Process
In this topic, we will understand everything about invention and patent filing process.
11. Value Engineering
In this topic, we will cover everything about VAVE approach to optimize the cost.

Chapter 6 - DFMEA (AIAG)

Duration – 1 Week (2 hours each day)
1. Failure Mode Avoidance (FMA)
In this topic we will understand basics about DFMEA and FMA process.
2. Pre-DFMEA Tools
In this topic, we will study Pre-DFMEA tools like Boundary Diagram, Interface Matrix, Product Structure Tree (PST), Function Tree (FT), Fault Tree Analysis (FTA), Parametric Diagram, RCL, IFRL. We will deep dive into each tool with examples.

3. DFMEA (AIAG)
In this topic we will learn to fill each column of DFMEA form as per AIAG Manual.

Chapter 7 - PPAP (AIAG)

Duration – 1 Week (2 hours each day)
In this course, we will study 18 documents and records needed for product Approval as part of PPAP as per AIAG Manual.

Chapter 8 – Basics of Engineering

Duration – 2 Week (2 hours each day)
In these sessions, we will revise critical engineering subjects in perspective of job interviews.

Chapter 9 – Resume Building & LinkedIn and Interview Skills

Duration – 1 Week (2 hours each day)
In these sessions, you will learn to build effective resume, LinkedIn profile and Project Portfolio and also interview skills including mock-ups

Chapter 10 – Design Projects

Duration – 3 Weeks (2 hours each day)
In this section, students will work on industry mock-up projects using design skills they learned during the course.

Chapter 11: CATIA V5 Mechanical Design

Duration = 60 Hrs.

- CATIA V5 overview in Mechanical Design
- 3D Modeling, Parts, Assemblies, Sheetmetal & Surfacing
- Drafting & Detailing
- Working on Industry Domain Oriented Case Studies / Projects like:
    - Creating Surfacing & Sheetmetal Parts
    - Automotive Plastics Interior and Exterior Trims
    - Introduction to Seating System Design
    - BIW Welding / Fixture Design
    - BOM Creation
    - Product Design & Development

Chapter 12: Computer Aided Design using SolidWorks

Duration = 60 Hrs.
Note: Students can select Autodesk Inventor / Solid Edge Software instead of SolidWorks if the job requirement is available on these tools.

- SolidWorks overview in Mechanical Design

- Understanding 2D Drawings and converting them into 3D Models
- Sketch- Drafting & Detailing
- Assembly Modeling
- 3D Modeling and Drafting of Engineering Parts, Sub-Assemblies and Assemblies
- Creating Parametric Drawings with GD&T and Engineering Calculations
- AutoCAD to SolidWorks Models
- Working on Industry Domain Oriented Case Studies / Projects like:
    - SPM / Jigs & Fixtures / Machines and Equipments
    - Sheetmetal / Packaging Industry / Equipment Design
    - Machine Design
    - Sheetmetal Design

Chapter 13: NX CAD for Design Engineers

Duration = 60 Hrs.

- CATIA V5 overview in Mechanical Design
- 3D Modeling, Parts, Assemblies, Sheetmetal & Surfacing
- Drafting & Detailing
- Working on Industry Domain Oriented Case Studies / Projects like:
    - Create 2D & 3D Tooling Processes
    - Tooling Designing
    - BIW Welding / Fixture Design
    - Automotive Plastics Interior and Exterior Trims
    - BIW Welding / Fixture Design
    - BOM Creation
    - Product Design & Development
    - GD&T

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