INDUSTRIAL MAINTENANCE: LAYOUT AND FABRICATION TECHNICIAN

Levels 1-7

Learners on this pathway concentrate on engineering drawings and blueprints with the goal of preparing to work with various materials for manufacturing including composites and formed metal. This pathway employs seven levels covering 23 areas of expertise through 118 courses. It will take learners 127 hours to complete this pathway.

Level 1 introduces learners to engineering drawings with courses on the fundamentals of blueprints and their design, blueprint work specifically for the aerospace industry and advanced blueprint reading. Level 2 focuses on aerospace wire installation and composting installation drawings, along with introducing the concepts and practices of geometric dimensioning and tolerancing. Level 3 focuses on the basics of drilling and riveting and an introduction to bound metal deposition. Level 4 delves further into composites, with emphasis on the history and nature of composites, materials used to form them and how composites are manufactured. Level 5 continues with composites, focusing on material storage, tool use and the knitting process. Level 6 introduces skills related to working with composite parts, including damage assessment and repair and culminates in a damage repair project. Finally, Level 7 introduces the main approaches to metal forming and stamping with a toolmaking project as a capstone.

Among the objectives for this pathway, learners will be able to:

- describe methods of creating an engineering drawing
- list types of composite materials
- understand the various materials used in forming tools
- list common defects of composite parts that can and cannot be detected in a visual inspection
- understand the skills need to be successful in metalworking

Total # of Modules: **118**

Total Hours: **127**

LAYOUT AND FABRICATION TECHNICIAN

Level 1

Blueprint Reading Fundamentals
- 1.1 Introduction to Blueprints
- 1.2 Engineering Drawing Terminology
- 1.3 Engineering Drawing Views
- 1.4 Engineering Drawing Lines
- 1.5 Dimensions and Tolerances

Blueprints and Picture Sheets for Aerospace
- 1.6 Aerospace Introduction to Blueprints
- 1.7 Blueprint Terminology
- 1.8 Blueprint Views
- 1.9 Blueprint Lines
- 1.10 Blueprint Dimensions and Tolerances
- 1.11 Blueprint Symbols

Advanced Blueprint Reading
- 1.12 Geometric Dimensions and Tolerances
- 2.13 Assemblies and Fits
- 2.14 Threads and Fasteners

Level 2

Aerospace Wire Installation Drawings
- 2.1 Engineering Drawing Review
- 2.2 Wire Bundle Installation Paperwork
- 2.3 Electrical Production Illustrations

Composite Engineering Drawings and Instructions
- 2.4 Engineering Communication
- 2.5 Composite Engineering Drawings
- 2.6 Work Instructions

Geometric Dimensioning and Tolerancing
- 2.7 Introduction to GD&T
- 2.8 GD&T Terms and Symbols
- 2.9 Rules of GD&T
- 2.10 Geometric Tolerances
- 2.11 Datums
- 2.12 Form Tolerances
- 2.13 Profile Tolerances
- 2.14 Orientation Tolerances
- 2.15 Runout Tolerances
- 2.16 Location Tolerances

Level 3

Additive Manufacturing
- 3.1 Introduction to Bound Metal Deposition

Basic Drilling and Riveting
- 3.2 Marking Fastener Locations for Drilling Project
- 3.3 Setting Up the Drill Motor
- 3.4 Drilling Pilot Holes and Enlarging Holes
- 3.5 Deburring
- 3.6 Driving Protruding Head Rivets

Level 4

Introduction to Composites
- 4.1 Background and History of Composites
- 4.2 Composite Industries and Products
- 4.3 Advantages and Disadvantages of Composites
- 4.4 Safety and Hazards of Composites

Composite Manufacturing Facilities
- 4.5 Facility Layout
- 4.6 Non-controlled Contamination Areas
- 4.7 Lay-up Area
- 4.8 Curing Area

Materials Used in Composite Manufacturing
- 4.9 Fiber Based Composites
- 4.10 Fibers, Tapes and Fabrics
- 4.11 Glass and Carbon Fibers
- 4.12 Matrix Types and Properties
- 4.13 Curing Process
- 4.14 Honeycomb Core Materials
- 4.15 Material Compatibility
- 4.16 Galvanic Reactivity
- 4.17 Core Potting Compounds

Level 5

Composite Material Storage
- 5.1 Fiber Material Storage
- 5.2 Controlled Contamination Areas

Tools used in Composite Manufacturing
- 5.3 Local Exhaust Ventilation
- 5.4 Forming Tools
- 5.5 Coefficient of Thermal Expansion
- 5.6 Forming Tool Inspection
- 5.7 Forming Tool Cleaning
- 5.8 Forming Tool Storage
- 5.9 Rollers and Sweeps
- 5.10 Overhead Laser System

Composite Material Kitting
- 5.11 Kitting with a Sheeter
- 5.12 Kitting by Hand
- 5.13 Kitting with Automated Machines

Level 6

Composite Part Layup and Bagging
- 6.1 Ply Balancing
- 6.2 Material splicing
- 6.3 Wrinkles and Gaps
- 6.4 Pockets and Voids
- 6.5 Radius Filler Fabrication by Hand
- 6.6 Advanced Bagging
- 6.7 Bagging and Lay-up Equipment
- 6.8 Preparation for the Lay-up Process
- 6.9 Cure Cycle Controllers - Temperature Controls
- 6.10 Thermocouple Science

Inspecting Composite Parts
- 6.11 Introduction to Inspection of Composites
- 6.12 Visual Inspection for Composites
- 6.13 Ultrasonic Inspection for Composites
- 6.14 Tap Inspection for Composites

Inspecting Part Damage and Repair
- 6.15 Composite Repairs
- 6.16 Aircraft Damage
- 6.17 Damage Assessment
- 6.18 Repair Tools and Materials

Composite Layup Projects
- 6.19 Unidirectional 4 Ply Lay-up
- 6.20 Carbon 8 Ply Lay-up with Core
- 6.21 Fiberglass 6 Ply Wet Lay-up

Drilling Composites Project
- 6.22 Drilling Composite Material
- 6.23 Marking Hole Locations
- 6.24 Drilling Pilot Holes in Titanium
- 6.25 Drilling Row JD3
- 6.26 Drilling Row JD7
- 6.27 Enlarging Holes in Rows JD1 and JD5
- 6.28 Enlarging Holes in Rows JD2 and JD6
- 6.29 Enlarging Holes in Row JD4

Composite Part Damage and Repair Project
- 6.30 Surface Damage Assessment
- 6.31 Surface Damage Repair
- 6.32 Disbonding Damage Assessment
- 6.33 Disbonding Damage Repair

Level 7

Introduction to Metal Forming
- 7.1 Introduction to Metalworking Processes
- 7.2 Introduction to Bulk Metal Forming
- 7.3 Introduction to Rolling
- 7.4 Introduction to Forging
- 7.5 Introduction to Extruding
- 7.6 Introduction to Bar and Wire Drawing
- 7.7 Introduction to Sheet Metal Forming

Introduction to Metal Forming
- 7.8 Introduction to Metal Stamping
- 7.9 Introduction to Metal Spinning
- 7.10 Introduction to Roll Forming
- 7.11 Introduction to Slide Forming
- 7.12 Introduction to Sheet Hydroforming
- 7.13 Introduction to Tube Forming
- 7.14 Introduction to Metal Fabricating

Toolmaking Capstone Project
- 7.15 Need for Tools
- 7.16 The Process
- 7.17 Permanent Assemblies
- 7.18 Critical Features
- 7.19 Final Details