

Internship Learning Log

Industrial Robotics & Automation — machines, robots & electrical systems

Prepared by Varish

June 30 – July 4, 2025

Nashik, Maharashtra

5-Day Summary

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Internship Overview

Dates	June 30 – July 4, 2025 (5 days)
Location	Nashik, Maharashtra
Mentor	Mrs. Vasudha Chandratre
Host	Rhythmsoft Robotics & Automation — turnkey robotics for automotive OEMs
Context	IBDP summer internship; bridging classroom theory with industrial automation reality

LEARNING OBJECTIVES

 Role of Automation Why factories use robots — productivity, consistency & safety	 Engineering Design How ideas become working machines; cost vs performance
 Industrial Robotics Robot types, components & control systems	 Shop Floor & Careers Workflows, safety & engineering disciplines

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About Rhythmsoft

2000 Founded — by Mr. Pritish Chandratre	6 Countries served globally
250+ Employees	400+ Turnkey installations delivered

Press Shop	Body Shop	Paint Shop	Powertrain	Final Assembly
BIW / CCB	Rail Systems			

Integrity · Trust · Excellence · Passion for Growth · Spirit of Partnership

- ▶ **Turnkey automation:** end-to-end robotic solutions for major automotive OEMs
- ▶ **Customisation:** tailors every solution to each customer's unique needs
- ▶ **Technologies:** MIG, Spot, Laser & Stud welding robots; Vision Systems; EOAT
- ▶ **Industry 4.0:** IoT-enabled monitoring & real-time analytics on the line
- ▶ **Sustainability:** Nashik facility runs on 100% solar energy

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Day 1 — Orientation & Factory Tour

ORIENTATION

- ▶ **Company intro** — led by mentor Mrs. Vasudha Chandratre
- ▶ **Facility walkthrough** — full tour of the Nashik plant
- ▶ **Safety briefing** — protocols & PPE induction
- ▶ **Divisions overview** — automation practices mapped
- ▶ **Company history** — 25-year journey & milestones

5-DAY PLAN AT A GLANCE

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Orientation Tour & safety	Machines Milling, drilling, lathe	Advanced Flame, band saw, CNC	Robots KUKA & clamping	Electrical PLC & control panels

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Key Takeaways

- The Full Lifecycle of a Machine**
Saw how a machine goes from raw material to working robotic system on a live shop floor — design, fabrication, assembly and deployment.
- From Mechanical to Electrical**
The week moved from mechanical processes (milling, drilling, lathe) through robotics into the electrical systems — PLCs, control panels, 3-phase power — that bring machines to life.
- Machines Are Problem-Solvers**
Every machine and robot existed to solve a specific problem — consistency, speed, safety or precision. That reframed how I see engineering.
- Desire to Work with Machines**
The internship strengthened my interest in robotics, IoT and the intersection of hardware and software engineering.

DAY 2 Machines & Tools Workshop

The foundational mechanical machines of the shop floor

Milling & BFW Advanced Milling

Manual milling: trims components to length & width in the X-Y plane; slow, with sandpaper for final edges. **BFW advanced:** fully adjustable X, Y & Z planes; performs fillets; oil + water coolant for a smooth finish; plastic cover stops material fly-off; digital ruler verifies each cut.

X-Y-Z planes

Oil + water coolant

Digital ruler

DRO Drill · Lathe · Tapping

DRO drill: operator sets origin on-screen; 3-stage sequence (centre drill → pilot → reamer); 4 gear modes — larger drill = slower gear; water + oil coolant prevents rust & stickiness. **Lathe:** spins material to shape circular profiles; controls inner & outer radius. **Tapping:** threads holes for nuts & screws using tapping oil.

DAY 3 Advanced Machines & Processes

Semi-automatic machines, cutting, and surface finishing

BatilBoy / HyCUT

Semi-automatic drilling & milling — drill stays fixed, platform moves in X, Y, Z. Operator codes the cut from a screen origin. Always 2 milling cycles: 1st fast (rough), 2nd slow (clean finish). **Speed** = motor rotation, **feed** = table speed — they must always match.

Flame Cutting & Band Saw

Flame cutting: LPG + oxygen at 5–6.5 bar cuts metal up to 100mm thick. **Band saw:** cuts pipes, rods & pillars; 2 blade types (big teeth for solids, small for pipes); wrong blade damages the saw; cooling oil recycled twice.

Painting & VMC / CNC

Painting: remove rust & weld marks → phosphoric-acid wash → primer → 2 glossy coats → smooth finish (4L paint + 1L binder). **VMC/CNC:** pre-coded machines cut large pieces & round cylinders fast with coolant jets; a factory ruler is called a caliper.

DAY 4 KUKA Robot & Air Pressure Clamping

Industrial robotics and the systems that hold the work in place

The KUKA 6-Axis Robot

The main shop-floor robot — 6 axes, controlled by a **teaching pendant** linked to a control box (which stores the data, not the pendant). 4 deadlock buttons + 3 play buttons must be pressed to move it.

Modes

T1 train · T2 test · AUTO · E (expert)

Movement

6-axis · X/Y/Z · Centre tools · Joystick

Pathing

PTP shortest · LIN straight · CIRC curve

Coding

LOOP/REPEAT · GOTO label jumps

Air Pressure Clamping

Compressor-fed air closes & secures clamps for tasks like welding. Each clamp has **2 pipes**: one throws pressurised air to clamp, the other receives air to release.

Clamping cycle: air inlet pushes the piston down → clamps the piece to the surface. To release, the air outlet sucks air out → creates a vacuum → pulls the piston back up.

Compressor-fed

Piston + vacuum

Used for welding

DAY 5 Electrical Systems

The control panel, power theory and protection behind every robot

The Control Panel

The electrical box controlling all power to a robot — housing the **PLC** (holds all code, directs correct voltage to each device), isolation transformer (removes current spikes to protect the PLC), relays and breakers.

Relays

Switch robot power; emergency-stop hub

Breakers

Main + miniature; overload protection

Grounding

Routes fault current; protects the PLC

Electrical Theory

Loads: inductive (windings/motors), capacitive (raises power factor), resistive. **Power factor:** angle between voltage & current — higher = more efficient; capacitors raise it; DC always = 1. **3-phase:** phases 120° apart, far more efficient for large loads (factories use 2–3; homes use 1).

Protection & Conversion

Circuit breakers trip on overload/short via electromagnets or bimetallic strips (spring separates the conductor). **AC** is preferred — less energy loss; an **inverter** (with MOSFETs) converts DC → AC.