| 5 WK | 14 | 75% | 1:8 | 20 |
|---|---|---|---|---|
| Focused program | Hands-on modules | Lab & field time | Instructor ratio | Max batch size |

## COURSE CONTENT — 14 FOCUSED MODULES

Every module maps to a real deployment task.

MODULE 01

[THEORY]

### Introduction to AMRs

AMR vs AGV, robot anatomy, industry verticals, market landscape, ISO 3691-4 safety overview.

AMR vs AGV · Robot anatomy · ISO 3691-4

MODULE 02

[THEORY]

### Introduction to RIS

Robot Integration Software — fleet middleware architecture and how RIS sits between robot and WMS.

Fleet middleware · RIS architecture · Platform overview

MODULE 03

[LAB]

### Localisation

AMCL, particle filters, EKF odometry fusion. Tune a live localisation stack and measure pose drift.

AMCL · EKF fusion · Pose estimation

MODULE 04

[LAB]

### Mapping

Generate operational 2D maps with SLAM Toolbox. Map formats, quality criteria, storage workflows.

SLAM Toolbox · 2D LiDAR · Map validation

MODULE 05

[LAB]

### Map Editing

Add forbidden zones, virtual walls, speed zones, and docking areas to production maps.

Virtual walls · Speed zones · Map editor

MODULE 06

[LAB]

### Path Planning

A*, Dijkstra, DWB, TEB. Configure Nav2 planners, send multi-waypoint missions, handle failures.

Nav2 · A* / DWB · Waypoint missions

MODULE 07

[THEORY]

### WMS Concepts

Order lifecycle, task types, robot dispatch models, and end-to-end WMS–AMR workflow.

Order lifecycle · Task dispatch · WMS integration

MODULE 08

[LAB]

### Costmaps

Static & dynamic costmaps, inflation layers, obstacle layers. Tune for narrow aisle navigation.

Inflation layer · Obstacle layer · Narrow aisles

MODULE 09

[LAB]

## Multi-Robot Coordination

Fleet task allocation, shared lanes, priority zones, deadlock detection and resolution.

Task allocation · Deadlock prevention · Open-RMF

MODULE 10

[LAB]

## REST API Integration

Design REST APIs for task dispatch. Build a live WMS-to-robot dispatcher using HTTP and MQTT.

REST APIs · MQTT · Task dispatcher

MODULE 11

[LAB]

## Obstacle Avoidance

Static and dynamic obstacle handling, sensor coverage tuning, recovery behaviour config, stress test.

Recovery behaviours · Sensor tuning · Stress test

MODULE 12

[FIELD]

## Site Survey & WiFi Audit

Facility survey checklist, floor prep, reflector placement, WiFi signal mapping, readiness report.

Site checklist · WiFi mapping · Readiness report

MODULE 13

[LAB]

## OTA Firmware Audit

Staged firmware rollout, version management, rollback procedures, post-update validation.

OTA rollout · Rollback drill · Version management

MODULE 14

[CAPSTONE]

## Acceptance Testing & Audit

Acceptance test plan execution — mission success rate, cycle time, MTBF, localisation accuracy.

Acceptance test · KPI benchmarking · Audit report

## 5-WEEK SCHEDULE

Two phases — Foundations then Deployment — each building directly on the last.

| | | | |
|---|---|---|---|
| 1 | Phase 1 | **Foundations**<br>M01 — Intro to AMRs · M02 — Intro to RIS · M03 — Localisation | THEORY<br>LAB |
| 2 | Phase 1 | **Maps & Navigation**<br>M04 — Mapping · M05 — Map Editing · M06 — Path Planning | LAB<br>FIELD |
| 3 | Phase 1 | **Systems & Integration**<br>M07 — WMS Concepts · M08 — Costmaps · M10 — REST API | THEORY<br>LAB |
| 4 | Phase 2 | **Fleet & Safety**<br>M09 — Multi-Robot · M11 — Obstacle Avoidance · M12 — Site Survey | LAB<br>FIELD |
| 5 | Phase 2 | **Go-Live & Audit**<br>M13 — OTA Firmware · M14 — Acceptance & Audit | CAPSTONE<br>FIELD |

## REPRESENTATIVE HANDS-ON LABS

Every module includes a lab. These are selected examples — each with a measurable outcome.

LAB · M03

### EKF localisation drift measurement

Configure robot_localization with odometry and IMU. Measure drift before and after tuning over a 50 m run.

→ Localisation error under 5 cm over 50 m closed loop

LAB · M04

### SLAM mapping of a mock warehouse

Drive a physical AMR through a staged facility with SLAM Toolbox. Generate and validate an operational map.

→ Map passes site survey checklist — ready for Nav2

LAB · M08

### Costmap tuning for narrow aisles

Reproduce a classic failure — robot refuses a 900 mm aisle. Tune inflation and footprint to fix it.

→ Aisle navigation: 0% → >95% success rate

LAB · M09

### 3-robot deadlock scenario

Deploy 3 robots on shared lanes. Trigger a deadlock, diagnose it, resolve with priority rules.

→ Zero deadlocks in a 1-hour fleet run

LAB · M10

### WMS-to-robot REST API dispatch

Build a dispatcher pushing tasks from mock WMS to live AMR fleet. Measure end-to-end latency.

→ Task cycle under 3 s from WMS trigger to motion

LAB · M12

### Facility site survey & WiFi audit

Use the Redefine Robotics checklist to audit a facility — dead zones, floor issues, reflector placement.

→ Signed deployment readiness report produced

LAB · M13

### OTA rollout & emergency rollback

Stage a firmware update across 3 robots. Simulate a bad update and rollback within 90 seconds.

→ Full rollback — zero fleet downtime

LAB · M14

### Acceptance test & deployment audit

Execute acceptance test suite against SLA — mission rate, cycle time, MTBF, localisation accuracy.

→ Signed audit report — all KPIs meet deployment SLA

## WHO THIS PROGRAM IS FOR

### Fresh graduates

ME, EE, or CS engineering graduates wanting to specialise in AMR deployment and gain real hands-on experience fast.

**PREREQUISITES**

- Basic Linux command line
- Python or C++ fundamentals
- Undergraduate engineering degree

### Industry engineers

Automation or controls engineers transitioning into AMR-focused roles in warehousing, manufacturing, or intralogistics.

**PREREQUISITES**

- 1+ year industry experience
- Embedded or systems background
- Basic networking concepts

### Corporate cohorts

Companies deploying AMR fleets can enrol teams — customised to your specific robot platform and facility environment.

**PREREQUISITES**

- Platform-specific customisation
- On-site delivery available
- Post-training deployment support

## LEARNING OUTCOMES

✓ Configure and tune a full ROS 2 / Nav2 localisation and navigation stack

✓ Generate SLAM maps, edit them for production use, and manage map lifecycles

✓ Configure costmaps and resolve common path planning failure modes

✓ Design and run multi-robot coordination with deadlock prevention

✓ Integrate AMR fleets with WMS systems via REST APIs and MQTT

✓ Conduct facility site surveys and WiFi audits to a professional standard

✓ Execute OTA firmware rollouts and perform emergency rollback procedures

✓ Write and execute structured acceptance test plans and produce audit reports

## CERTIFICATION

### Certified AMR Deployment Engineer

Graduates who complete all 14 modules, all labs, and the acceptance audit capstone receive a verifiable digital credential issued by Redefine Robotics Pvt. Ltd — recognised by AMR integrators and intralogistics companies.

✦ Verifiable digital badge (Credly)

- ✦ Redefine Robotics certified credential
- ✦ Capstone audit report as portfolio piece
- ✦ Access to Redefine alumni deployment network
- ✦ LinkedIn credential integration

## ENROLLMENT — BATCH 01

| Sep 8 | 20 | 5 WK |
| --- | --- | --- |
| Start date | Seats available | Full-time, in-person |

**Apply at redefinerobotics.in/training · Applications close August 22, 2025**