Course goal
The goal of the course is to improve the ability of the run the Robot cell, Program Modification and responsible for engineering, commissioning, operation and Maintenance of Robotics for Automation.

Learning objectives
Upon completion of this course, students will be able to:
- understand the use of Robot operational Safety and Handling
- understand the critical elements of operation & maintenance of Robots
- Programming, modifications
- Calibration
- System Installation
- Maintenance
- Completer repair
- General troubleshooting

Participant profile
Personnel from production and operations engineering department, consultants responsible for engineering, commissioning, operation and maintenance of substations

Prerequisites
Degree or diploma in engineering, basic knowledge of automation product, maintenance knowledge

Topics
- Programme Theme, Overview
- Introduction of ABB Robot and their types, Robot Specification : Payload, Reachability, Robot Controller and Operation panel
- Manipulator Overview, Flex Pendant Overview
- Safety Overview and Run Chain
- Jogging, Axis Mode, Linear Mode, Reorientation
- Description of Robot Coordinate system, Base, World, Tool, Work Object
- Tool Center Point and Defining the TCP
- Motion Instruction MoveJ, MoveL, MoveC

Topics
- RAPID Program structure, Routines, Modules, Program Data
- Input and Output Signals
- Logical Instruction/Program Flow Instructions COPACT IF, IF AND THEN, PROCALL
- ModPos or Teaching of Program
- Program EDIT by Copy/Paste
- Saving and loading of user programmes and Parameters
IN-RB04

Basic Robot Programming, Installed System Overview & Electrical/Mechanical Maintenance

- Taking Backup of the Robot system and restore the system, Installation
- Calibration and Revolution Counter Update
- Maintenance & troubleshooting, SMB Battery replacement
- FOR, WHILE, GOTO and LABEL, TEST Assign, =; Mathematical Instruction
- Operator Communication Instructions TPErase, TPWrite, TPReadNum, TPReadFK
- Clock Instructions and Cycle Time calculation
- Offset Function, Benefit of Offset Programming
- Interrupt & TRAP routines
- Event Logs
- Programming Example
- Software System Architecture
- Robot Ware explanation
- Explanation Of installed Robot Program, Simulation and testing in Robot Studio, Modifications
- Step by Step explanation of RAPID modules
- Function Routines
- Restart Procedures
- UAS: User Authorization System
- Systems Diagnostics Data
- Electrical/Mechanical Maintenance Overview
- Fine Calibration & Calibration Offset
- Block Diagram of Controller and Manipulator
- Electrical Diagram and Circuit Diagram
- Description of Robot Hardware Computer System, Memory System Drive, System, Motors, Resolver Battery
- Lubrication Oil and Inspection of Gearboxes
- Computer System, Memory System Drive, System, Motors, Resolver
- Replacement of Robot Spare Parts
- Programming Example
- System Builder in Robot Studio
- Robot Ware Software Download
- hand-on exercise

Course type and methods
This is an instructor led seminar with practical exercises. The language of the course is English.

Course Duration
The duration of the course is Five days.
## Course Outline

<table>
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<th>Day 1</th>
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| Progreme Theme, Overview  
Introduction of ABB Robot and their types, Robot Specification: Payload, Reachability, Robot Controller and Operation panel Manipulator Overview, Flex Pendant Overview,  
Safety Overview and Run Chain  
Jogging, Axis Mode, Linear Mode, Reorientation  
Description of Robot Coordinate system, Base, World, Tool, WorkObject  
Tool Center Point and Defining the TCP  
Motion Instruction MoveJ, MoveL, MoveC,  
hand-on exercise & Practices |  
RAPID Program structure, Routines, Modules, Program Data  
Input and Output Signals  
Logical Instruction /Program Flow Instructions  
COPACT IF, IF AND THEN, PROCALL  
ModPos or Teaching of Program  
Program EDIT by Copy/Paste  
Saving and loading of user programs, and Parameters  
Taking Backup of the Robot system and restore the system, Installation  
Calibration and Revolution Counter Update  
Maintenance & troubleshooting, SMB Battery replacement  
Question & Answer, Summarizing |

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Assign, =, Mathematical Instruction  
Operator Communication Instructions  
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Step by Step explanation of RAPID modules  
Function Routines  
Restart Procedures  
UAS: User Authorization System  
SysDiagnosticsData  
hand-on exercise |
### Day 5

- Electrical/Mechanical Maintenance Overview
- Fine Calibration & Calibration Offset
- Block Diagram of Controller and Manipulator
- Electrical Diagram and Circuit Diagram
  - Description of Robot Hardware
  - Computer System, Memory System Drive, System, Motors, Resolver
  - Battery
- Lubrication Oil and Inspection of Gearboxes
- Computer System, Memory System Drive, System, Motors, Resolver
- Replacement of Robot Spare Parts
- Programming Example
- System Builder in Robot Studio
- Robot Ware Software Download