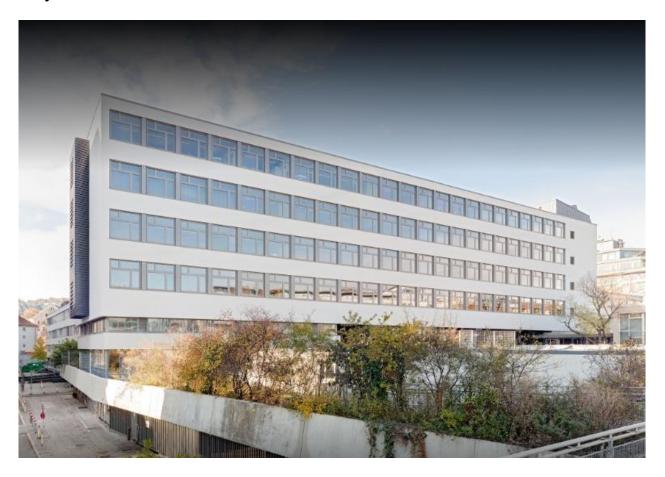# mes Training Curriculums

INDI4.0 Project Stuttgart | 06/2021 Workshop documents Intellectual Output "O2"

Manufacturing Execution System

with Siemens TIA Portal
OPC-UA Client Server

Learning situation:	Creation of the data structure for the OPC UA communication based on the MES-Basic and CP-Lab

Competence area / subject:	Professional competence
School type / occupational field / occupation:	Vocational / technical school / electrical engineering / mechatronics

- Requirement area:	Compare and select communication interfaces of an MES. Configure the selected interface
Time range:	2 units
Learning factory:	Festo CP-Factory and CP-Labs, module turning
Technical settings:	Projector, PC with Windows, tablet (WLAN). Internet access, S7 1500 CPU
Software:	OPC UA clients with .NET from SIEMENS / TIA V14

Brief description and learning objectives this lesson sequence:

- Define the required communication variables
- Create data type

Information about the learning factory

The i4.0 project Offenburg comprises three pillars:

1. **Expansion of the basic laboratory** Drive technology
   The basic laboratory was additionally equipped with a servo machine test bench for examining the various electrical machines from Lukas-Nülle. Part of the acquisition is also the Interactive Lab Assistant from Lukas Nülle, with whose help the pupils can work on the interactive experiment set-ups.

2. **Basic control technology laboratory** with 4 CP Labs from Festo Didactic.
   The CP Labs are equipped with the application modules "turning", "stacking magazine", "measuring analog", "workpiece output". A CPU 1512 from Siemens is located in each CP Lab. Another module is additionally equipped with an industrial camera from Sick and a module with a Keyence SR-2000 industrial camera for the recognition and evaluation of QR codes by the PLC

3. **CP Factory Industry 4.0** from Festo Didactic with the modules "high-bay warehouse", "basic module switch", "robot assembly cell with Kuka KR6", "robot loading cell with Kuka KR6", "CNC Concept Mill 55", "basic module with application turning", "basic module with Analog measurement application "," Basic

module with drilling application "," Basic module with pressing application "," Basic module with heating application "," Basic manual workstation module "," Docking AGV "module and self-propelled AGV system" Robotino ".

Further information can be found under the following links:

Festo company:
https://www.festo-didactic.com/de-de/lernsysteme/lernsysteme-fuer-industrie-4.0

Lucas Nülle company
https://www.lucas-nuelle.de/191/apg/2/Produkte/Maschinen-Antriebstechnik.htm

Goal analysis for the binding classification in the learning area lessons / for the course planning:

competency-based goals (1: 1 from BP)	Contents (1: 1 from BP)	Action result	interdisciplinary skills
There is not any	There is not any		

Progress planning

Methodical and didactic information

dura-tion	phase	What is learned	How do you learn?		media	material	Cooperation, notices, Explanations
		Desired competencies	Action of the teacher	Action of the pupils			
10	E, ERA	Recognize topic or task / problem.	-> Which communication va-riables are required for com-munication with the MES? Discussion and issue AB.		PC, B, documents LFB module I431 AWAY	CPU S7-1500, TIA V14, OPC UA Client,	AB -> 3. UE Doc 02 Works-heet.docx
20	ERA	Create data block "dbPorcessData".		Create a data block with the name: "dbPorcessData". Add the necessary variables for MES communication to this.	PC, TT, AB	CPU S7-1500, TIA V14, OPC UA Client,	AB -> 3. UE Doc 02 Works-heet.docx
30	ERA	Create data structure (PLC data types).		Answer questions on the topic or look for possible solutions. Create data type "TProces-	PC, TT, AB	CPU S7-1500, TIA V14, OPC	AB -> 3. UE Doc 02 Works-heet.docx

				sData". Declare the "typProcessData" tag in the data block.		UA Client,	
20	ERA	Testing communication.		Answer questions on the topic or look for possible solutions. Test the communication using "Read and Write" and also "Read / Write Struct / UDT". Recognize problems here and look for possible solutions.	PC, TT, AB	CPU S7-1500, TIA V14, OPC UA Client, , TIA help portal	AB -> 3. UE Doc 02 Worksheet.docx
10	K	Knowledge building		Hold knowledge / s on the AB. Present the result (s), describe the procedure, point out any problem (s) that have occurred and point out possible solutions.	PC, TT, AB, B		AB -> 3. UE Doc 02 Worksheet.docx

Abbreviations:

BA = processing, E = opening of lessons, ERA = development, FM = support measure, K = consolidation, KO = confrontation, PD = pedagogical

Phase:	diagnosis, Z = summary; R = reflection, T = review
	AP = audio player, B = projector, D = document camera, LB = textbook, O = overhead projector, PC = computer, PW = pin board, T = blackboard,
Media:	TT = tablet, WB = whiteboard; SPH = smartphone; ATB = Apple TV box

Further	AA = work order, AB = worksheet, AO = advance organizer, D = file, DK = documentation, EA = individual work, FK = professional competence,
Abbreviations:	FOL = slide, GA = group work, HA = homework, HuL = action and learning situation, I = Information, IKL = I can list, KR = competence grid, L =
	teacher, LAA = work order solution, LF = learning area, LNF = learning factory, O = folder, P = plenum PA = partner work, PPT = PowerPoint
	presentation, PR = Presentation, SuS = pupils, TA = blackboard, ÜFK = transferable skills, V = video

k = collective, cooperative = cooperative, i = individual

Learning phase: