

<Final>

1. PLC
2. Valves
3. CNC
4. Fuzzy

<Report>

5. IoT
6. IoS
7. Industrial Ethernet

1. PLC

Relay ↔ PLC difference / similarity

Ladder Diagram

NO / NC contact

Control Relay

Programming

- FBD (Function Block Diagram)
- LD (Ladder Diagram)
- ST (Structured Text)
- IL (Instruction List)
- SFC (Sequential Flow Chart)

Modul System (Power, CPU PLC, Digital IO, Analog IO)

Scan Time / PLC Operating Cycle

PLC Memory Utilization Map

- Executive Memory
- System Memory
- I/O Status Memory
- Data Memory
- User Memory

2. Valves

Valve Types

(2-way, 3-way ...)

(2-position, 3-position, ...)

Valve Sequencing

3. CNC

Lathes

Milling machines

Point-to-point positioning

Continuous path (Contouring)

Interpolation

G Code

M Code

CAM Programming

CNC Architecture

4. Fuzzy

Fuzzy Set

Fuzzy Membership Function

Rule-based System

Defuzzification

Centroid

Wikipedia Example

5. FA IoT

- Interoperability
- Virtualization
- Decentralization
- Real-time Capability
- Service Orientation
- Modularity

Role of big data & analysis
Impact of the industrial 4.0

IoT Common Definition
Cloud Computing
Semantic Technology

Cyber-physical System

6. FA IoS

SOA
ERP
MRP
Cloud Computing (Wikipedia)

- IaaS
- SaaS
- PaaS

7. Industrial Ethernet

VLAN
RSTP

QoS
IED

1. PLC

<http://jjackson.eng.ua.edu/courses/ece485/lectures/LECT01.pdf>

<http://highered.mheducation.com/sites/dl/free/0073510882/865906/pet10882OLCSampleChapterconstrained72.pdf>

Wikipedia Pages on PLC, IEC61131-3, Functional Block Diagram, Ladder Logic, Structured Text, Instruction List, Sequential Function Chart

https://www.idc-online.com/technical_references/pdfs/instrumentation/IntrotoPLCs.pdf

http://www.me.ua.edu/me360/fall05/Misc/Logic_Control_Systems.pdf

<http://www.allaboutcircuits.com/textbook/digital/chpt-6/programmable-logic-controllers-plc/>

http://davidlu.net/Topic_8_PLC.pdf?G=736

2. Valves

<http://apps.elizabethtown.kctcs.edu/members/jnail/fpxpowerpoint/7-directionalcontrolvalves.pdf>

<http://www.omega.com/auto/pdf/simpvalvesguide.pdf>

<http://www.omega.com/auto/pdf/simpvalvesguide.pdf>

3. CNC

[http://www.engr.uvic.ca/~mech410/CAM_references/CNC Computer Numerical Control Programmig Basics.pdf](http://www.engr.uvic.ca/~mech410/CAM_references/CNC_Computer_Numerical_Control_Programmig_Basics.pdf)

<http://wings.buffalo.edu/eng/mae/courses/460-564/Course-Notes/CNC%20notes.pdf>

<http://www2.mae.ufl.edu/designlab/Lab%20Assignments/EML2322L-CNC%20Machining.pdf>

4. Fuzzy

<http://www.facstaff.bucknell.edu/mastascu/econtrolhtml/Fuzzy/Fuzzy1.html>

Wikipedia Fuzzy Control System

5. FA IoT

[http://www.internet-of-things-research.eu/pdf/IERC Cluster Book 2014 Ch.3 SRIA WEB.pdf](http://www.internet-of-things-research.eu/pdf/IERC_Cluster_Book_2014_Ch.3_SRIA_WEB.pdf)

<http://www.gtai.de/GTAI/Content/EN/Invest/SharedDocs/Downloads/GTAI/Brochures/Industries/industrie4.0-smart-manufacturing-for-the-future-en.pdf>

Industry 4.0 Wikipedia Pages

6. FA IoS

[http://www.future-internet.eu/fileadmin/documents/madrid_documents/FISO/3b_Internet_of_Services_and_Internet_of_Things_Panel - Telefonica.pdf](http://www.future-internet.eu/fileadmin/documents/madrid_documents/FISO/3b_Internet_of_Services_and_Internet_of_Things_Panel_-_Telefonica.pdf)

Cloud Computing Wikipedia Pages

<http://www.comp.nus.edu.sg/~seer/book/2e/Ch10.%20Service%20Oriented%20Architecture.pdf>

http://www.iqms.com/news/ERP_For_Beginners_Reprint1.pdf

http://www.columbia.edu/~gmg2/4000/pdf/lect_06.pdf

7. Industrial Ethernet

https://www.eiseverywhere.com/file_uploads/57a033d8bb952c55738308764be1b5f9_wes_pap.pdf

http://www.cisco.com/web/strategy/docs/manufacturing/industrial_ethernet.pdf