

Automatic Control course

Lecture	Contents	Notes
Classic Control		
1	<ul style="list-style-type: none"> • Introduction of Control systems. • The main components of classic control. • Explain types of sensors; Theory of operation & wiring. • The symbols of main components & wiring diagram. 	must
2	<ul style="list-style-type: none"> • Direct on line starting method of induction motor. • explain the common mistakes during the design stage. • Design and Implementation of interface circuits. • Design and Implementation of practical exercises. <p>The required application is (start and stop Mixer's motor using the indicator lamps).</p>	must
3	<ul style="list-style-type: none"> • Design and Implementation of practical exercises. <p>(The required application is Mixer system include filling pumps).</p>	must
4	<ul style="list-style-type: none"> • Design and Implementation of practical exercises. <p>(The required application is Sand conveyors system and elevator).</p>	must
5	<ul style="list-style-type: none"> • Reverse Direction principle for AC Motor & DC Motor. • The electrical & mechanical interlock. • The different uses of double action Push button & Selector switch. 	must
6	<ul style="list-style-type: none"> • Design and Implementation of practical exercises. <p>(The required application is the overhead crane).</p>	must
7	<ul style="list-style-type: none"> • Explain of different types of Timers (Motor timer, Air timer & Electronic timer). • Explain of different functions of Timers (On delay timer, Off delay timer, On/Off delay timer, Flasher timer, etc.). • Design and Implementation of control circuits, each of them contain timer as a main part. 	must
8	<ul style="list-style-type: none"> • Design and Implementation of practical exercises. <p>(The required application no.1 is a cooling system for hydraulic oil). (The required application no.2 is Traffic light control circuit).</p>	must
9	<ul style="list-style-type: none"> • The difference between Star connection & Delta connection for Induction motor. • Star/Delta starting method. • Design the power and control circuits of one direction induction motor with starting Star/Delta. • Design the power and control circuits of two directions induction motor with starting Star/Delta. 	must
10	<ul style="list-style-type: none"> • Design and Implementation of practical exercises. <p>(The required application is Marble cutting machine works in two directions).</p>	must

Lecture	Contents	Notes
Classic Control		
11	<ul style="list-style-type: none"> Design and Implementation of practical exercises. (The required application is Jaw crusher system with conveyors & vibrators). 	optional
12	<ul style="list-style-type: none"> Speed control methods (by changing No. of Poles - by changing V/F). changing No. of Poles (explanation of two speed motor). changing No. of V/F (explanation of AC Drive theory of operation, wiring diagram and parameter setting). Soft Starting method for induction motor. 	optional
13	<ul style="list-style-type: none"> Design and Implementation of practical exercises. (The required application is Multispeed conveyor). 	optional
14	<ul style="list-style-type: none"> Design and Implementation of practical exercises. (The required application is Stretch wrapping machine). 	optional
15	<ul style="list-style-type: none"> Theoretical and Practical exam. 	must
PLC		
1	<ul style="list-style-type: none"> The history of PLC. The main parts of PLC. The wiring of PLC. The languages witch used in PLC programming. Design of Control Circuits using Ladder Diagram. 	must
2	<ul style="list-style-type: none"> Design and Implementation of all previous classical control circuits by (Schneider Electric Zelio) PLC 	must
3	<ul style="list-style-type: none"> Design and Implementation of practical application by (Schneider Electric Zelio) PLC (300 KW air screw compressor of gas station including the protection system) 	must
4	<ul style="list-style-type: none"> Overview of Simatic's generations (S5, Logo, S7-200, S7-300/400, S7-1200/1500). The main Parts of PLC unit (Compact type & Modular type)...Power Supply, CPU, Input Modules (Digital NPN-PNP & Analog), Output Modules (Digital Relay-Transistor & Analog), Memory, Battery. Different types of memory witch used in PLC (RAM, ROM, EPROM, EEPROM, Flash Memory). Wiring of PLC (AC/DC/RLY) and (DC/DC/DC). Difference between Programming Cables & Networking Cables. Hardware Configuration, PLC addressing & PLC Programming with TIA (Totally Integrated Automation) Software for S7-1200. 	must

Lecture	Contents	Notes
PLC		
5	<ul style="list-style-type: none"> • PLC tag table. • Bit Logic Operations (Normally Open Contact, Normally Closed Contact, Output Coil, Set Coil, Reset Coil). • CPU Scan time & Cyclic time. • Positive Trigger & Negative Trigger. • Different types of Memory size (Bit, Byte, Word, Double Word) and addressing of each size. • PLC Number Format (Binary, Decimal, Hexadecimal.....etc.) & Data Types. 	must
6	<ul style="list-style-type: none"> • Different types of programming blocks (Organization Block, Function, Function Block, Data Block). • IEC_Timers Operations (On Delay, Off Delay, On Delay Retentive, Pulse Timers). • Using of Move instruction with IEC_Timers. • Using of Compare instruction with IEC_Timers. • Different applications of IEC_Timers. • Clock memory. 	must
7	<ul style="list-style-type: none"> • IEC_Counters Operations ((Up, Down, Up/Down Counters). • Using of Move instruction with IEC_Counters. • Using of Compare instruction with IEC_Counters. • Different applications of IEC_Counters. 	must
8	<ul style="list-style-type: none"> • Math functions for Real & Integer numbers. • Different applications of Math functions. • Conversions instructions. 	must
9	<ul style="list-style-type: none"> • Program Control Operations (Jump, Jump not, Return, Stop). • Shift & Rotate Operations. • Different applications Shift & Rotate instructions. 	must
10	<ul style="list-style-type: none"> • Word Logic Operations (AND, OR, XOR, INVERT). • Watch Table, Force Table, Cross reference. • HSC (High Speed Counter) Via Rotary encoder. 	must
11	<ul style="list-style-type: none"> • Analog function (Scale X, Norm X). • Different Basic & Advanced industrial applications. 	must
12	<ul style="list-style-type: none"> • The Basic principles of HMI. 	optional
13	<ul style="list-style-type: none"> • Different Basic industrial applications of HMI. 	optional
14	<ul style="list-style-type: none"> • Theoretical and Practical exam. 	must

Lecture	Contents	Notes
HMI		
1	<ul style="list-style-type: none"> WinCC Run-Time file generation. AC Drive control via PLC (USS_Drive_ protocol) and Slider. 	must
2	<ul style="list-style-type: none"> WinCC Basic elements (Symbolic Input/output field - Slider – Bar & Gauge). 	must
3	<ul style="list-style-type: none"> WinCC Graphic design & Animation instructions (Visibility – Flashing & Movements). 	must
4	<ul style="list-style-type: none"> Alarm View & Event message system. Language and Resources. 	must
5	<ul style="list-style-type: none"> User Administration. Receipe Management. Trend view and Reports printing. 	must
6	<ul style="list-style-type: none"> Theoretical and Practical exam. 	must
SCADA		
1	<ul style="list-style-type: none"> The fundamentals of SCADA system Supervisory Control And Data Acquisition. 	must
2	<ul style="list-style-type: none"> Explanation of interface between computer & controllers (parallel Ports output - LabJack module). 	must
3	<ul style="list-style-type: none"> Introduction of programming software (LabView). 	must
4	<ul style="list-style-type: none"> Design and Implementation of practical exercises. 	must
5	<ul style="list-style-type: none"> Theoretical and Practical exam. 	must

- ❖ Duration of the course is 160 hours and the lecture's duration is four hour .
- ❖ At the end of the course, a project for each group is performed on the Prototype in our laboratory.
- ❖ Each trainee has a training Kit of his own to do all the exercises during the course.
- ❖ Task is required at the end of each chapter; Design, programming and implementation of a real project from the previous work of our company.
- ❖ The successful students in the course have a certificate of passing the course.