

3.01: TESTING AND CALIBRATION OF INDUSTRIAL INSTRUMENTS **(PRESSURE & TEMPERATURE)**

COURSE DURATION : 1 WEEK

COURSE AGENDA:

- Parts of the Typical Control Loop.
- Process & Instrument Diagrams (P&ID's)
- Introduction to Measurement System.
- Commonly used process control signals.
- Signal quality terminology (accuracy, linearity, span, etc.)
- System standards and instrument calibration.
- Study of measurement errors
 - ✓ zero, span, hysteresis, non-linear, dead-band errors
- Sensor/Transducer and Transmitter principles.
- Pressure Instruments – Principle, construction and operation.
- Calibration of low and high Pressure Bourden's Gauges.
- Principle and operation of Strain gauge Pressure Sensors.
- Principle and operation of Strain gauge Pressure Transmitters.
(2 wire and 4 wire configuration)
- Pressure Measurement & Control (Electronic and Pneumatic).
- Operation and calibration of Differential Pressure Switch & Safety Valve.
- Final control elements and Actuators.
- Operation and calibration of I/P Converter.
- Temperature Instruments – Principle.
- Sensors for temperature measurement.
- Types of RTDs & Thermocouples.
- Selection, Installation and Commissioning of RTD & Thermocouple.
- RTD – 2 Wire, 3 Wire and 4 wire Configuration.
- Thermocouple – Cold junction compensation and compensation cables.
- Calibration of Temperature Indicators (RTD & Thermocouple).

3:02 : DATA ACQUISITION (DAQ) AND INTERNET OF THINGS (IoT)

COURSE DURATION : 1WEEK

COURSE AGENDA:

- PC based Instrumentation.
- PC internal (ISA/PCI) and external Bus (RS232C, ETHERNET, USB, GPIB).
- Virtual Instrumentation Concepts.
- Graphical programming fundamentals.
- Agilent VEE Pro programming objects.
- Building application programs with Agilent VEE Pro.
- Create custom/user objects and user functions.
- Data exchange between other windows applications (DDE).
- Storing and retrieving data to/from files.
- Debug and optimize Agilent VEE programs.
- Building an operating interface with panels.
- User objects and user function panels.
- RS232C Interface.
- GPIB Interface Theory (IEEE 488.2).
- Controller, Talker & Listener.
- Controlling the RS232C instruments through PC.
- Controlling GPIB instruments through LAN.
 - Digital Multi-meter (Agilent -34401A, fluke 8845A),
 - Function Generator (Agilent- 33120A, Tektronix AFG-3021B),
 - Digital Storage Oscilloscope (Yokogawa – DL1520, Agilent DSO 1022A).
- SICL/VISA, Data Formatting/ SCPI Commands.
- Instrument Control Sequence.
- Detailed, hands-on instrument control techniques. (through Panel Driver, Direct I/O)
- Acquire and display Data from remote instrument.
- Print and plot the acquired data.
- USB TMC & LXI protocol.
- Configuring USB to GPIB gateway, LAN to GPIB gateway and Remote I/O server using Agilent I/O Connection Expert.
- Internet of Things (IoT) – Networks, Protocols
- Configuring mobile devices to access Veepro Panel view
- Web Monitoring

3.03 : ARM7 EMBEDDED SYSTEM DEVELOPMENT (LPC2378)

COURSE DURATION : 1 WEEK

COURSE AGENDA:

- Embedded Systems : Components of an embedded systems.
- Introduction to ARM
- ARM7-TDMI Architecture & Programmer's model
- Exploring KEIL IDE
- ARM & THUMB Instruction Set Architecture's
- ARM7 Assembly programming using Keil MDK tool chain
- LPC2378 - ARM7 based MCU Architecture & Programming using Embedded C
- Interfacing and Programming with LPC2378 (GPIO)
- Hardware Interfacing:
 - LCD interface.
 - ADC/DAC interface using I2C interface.
 - Stepper motor Interface.
 - Timer
 - RTC
 - Interrupts
- Overview of Serial protocols (SPI, I2C and CAN)
- Overview of ARM Cortex Cores

3:04 PROGRAMMABLE EMBEDDED SYSTEM IN CHIP (PSoC) DESIGN

COURSE DURATION – 1 WEEK

COURSE AGENDA:

- Overview of Embedded System.
- Types of Embedded System (general purpose, ASIC, FPGA, ARM and PSoC).
- PSoC-1, PSoC-3 and PSoC-5 architecture
- C51 Programming (HI-TECH/IMAGE CRAFT Compiler)
 - C programming language extensions necessary to support an embedded architecture
- Mixed Signal Array Design (PSOC-1) Architecture and Programming
- Programming the Flash Memory of the PSoC.
- Getting started with PSoC Designer and PSoC Programmer
- Design Practice using system designer
 - LED ON/OFF, LED Blink using software timer control
 - LED blink with push-button control
 - Display Data on LCD
 - Scrolling Display and Bar graph display in LCD
 - Acquire analog inputs and display on LCD.
 - LED brightness control using Pulse width Modulation
- Design Practice using Chip Editor
 - Configuration of Programmable I/O lines
 - 8/16 bit timer/counter design
 - 8/16 pulse with modulation
 - Interrupt service routine (ISR) for Timer/counter/PWM control
 - UART interface,PGA configuration.
 - ADC configuration (SAR, Integrator and sigma-delta ADCs)
 - Measurement of analog signal(ADC) and display on LCD and send it to PC using UART.
 - Working with Analog outputs (DAC)
 - Produce analog input based on computer inputs
 - PWM motor control,Stepper motor control
 - Temperature/speed measurement and control

3:05 ALLEN BRADLEY PLC PROGRAMMING AND MAINTENANCE (SLC-500)

COURSE DURATION : 1 WEEK

COURSE AGENDA:

- Understanding Programmable Controller Systems.
- Identifying Common Hardware.
- Components of Processors.
- Identifying Hardware Components of I/O Systems.
- Identifying I/O Configurations.
- Getting Started with Programming Systems.
- Creating a New Project.
- Determining Addresses and Assigning Symbols.
- Drafting Ladder Logic.
- Selecting and Programming Bit Instructions.
- Entering, Editing, and Verifying Ladder Logic.
- Selecting and Programming Timer Instructions.
- Selecting and Programming Counter Instructions.
- Entering and Searching for Documentation.
- Organizing the Data Table.
- Selecting and Programming Math Instructions.
- Selecting and Programming Data Handling Instructions.
- Selecting and Programming Comparison Instructions.
- Troubleshooting and Diagnostics.: Forcing Inputs and Outputs.
- Online editing
- Identifying error message and clearing error alarms.
- Troubleshooting Processor and Power Supply Problems.
- Troubleshooting Discrete I/O Problems.
- Understanding and configuring the RSLINX Communication Driver.

3.06 PROCESS AUTOMATION USING PLC & SCADA/HMI (AB SLC 500 & RSVIEW-32)

COURSE DURATION : 2 WEEKS

COURSE AGENDA:

- Understanding Programmable Controller Systems.
- Identifying Common PLC Hardware.
- Components of Processors.
- Identifying Hardware Components of I/O Systems.
- Identifying I/O Configurations.
- Getting Started with Programming Systems.
- Creating a New Project.
- Determining Addresses and Assigning Symbols.
- Drafting Ladder Logic.
- Selecting and Programming Bit Instructions.
- Entering, Editing, and Verifying Ladder Logic.
- Selecting and Programming Timer /Counter Instructions.
- Selecting and Programming Data Handling/Compare Instructions.
- RSLINX – configuring the communication driver
- Establishing PLC communication using RSLINX.
- Bird's eye view of RSView .
- Building an RSView Project/configure PLC communication.
- Building Tag Database and Expressions.
- Creating a Graphic Display.
- Adding Animation to Graphic Display.
- Management of Screens and Controls.
- Alarm Management & Trending.
- OPC / DDE process communication with other PLCs.
- Analog input and Analog output.
- Measurement & Control of process parameters like Speed, Flow and Temperature.
- Implementation of PID control functions and building graphical control panel

TITLE : COURSE AGENDA**COURSE TIMING : 9:00 AM TO 5:30 PM (FULL TIME)****RATIO : 20% THEORY : 80 % PRACTICAL HANDS-ON**

3.07: DO IT YOURSELF (DIY) – BUILD YOUR OWN FIREWALL

COURSE DURATION : 1 WEEK

COURSE AGENDA

- Enterprise Grade Open Source Firewalls can be constructed during a Do It Yourself (DIY) course.
- Network configuration : IP addressing, Gateway, DNS, DHCP, RFC 1918 private IPs
- Configuration of ADSL Modem/Router, WIFI Router
- TCP/UDP Ports overview
- Open Source Firewalls and tools
- Download the pfsense 4GB NanoBSD images with VGA
- Verification of MD5 hash
- Prepare a 4 GB USB drive as firewall with the downloaded pfsense image
- Set WAN and LAN addresses, DHCP configuration on firewall console
- Enable SSH access, Web GUI access to firewall from client PC
- Set Host and domain, Create Certificate Authority (CA) and Certificate
- Port forwarding, NAT, auto FIREWALL rule
- Access client PC web server from WAN side PC's browser
- Create PPTP VPN server, Set PPTP IP Pool Range, PPTP VPN user creation
- Backup and restore with changing of admin user name and password
- Port forwarding across ports on self-built firewall
- Overview of Cloud Technology (VMWare, VirtualBox, OpenVZ)
- Operational Overview of the QEMU/KVM/OpenVZ based cloud server
- Virtual Firewall on cloud server (QEMU/KVM Virtual machine pfsense on cloud)
- DNS forwarding
- Traffic Monitoring
- Multiple WAN, Load Balancing, Fail over/ Fail safe configuration