# Report on PLC-Advanced

**Date** :10-12-2019 to 13-12-2019 **III Year EEE** Students

**Venue** :EEE Simulation LAB Organized By **APSSDC**

**Programmable logic controller (PLC)**

A Programmable Logic Controller (PLC), also referred to as programmable controller, is the name given to a type of computer commonly used in commercial and industrial control applications. PLCs differ from office computers in the types of tasks that they perform and the hardware and software they require to perform these tasks.

While the specific applications vary widely, all PLCs monitor inputs and other variable values, make decisions based on a stored program, and control outputs to automate a process or machine. This course is meant to supply you with basic information on the functions and configurations of PLCs with emphasis on the S7-200 PLC family.

**Advanced automation training** topics can vary greatly depending on what industry you are in and your current employers equipment, will determine what specific advanced automation training you will need. Because it is difficult for any one person to learn all advanced automation topics, it is recommended you be actively working in the field before deciding which fit your needs best. But in the interim, you can start with learning more about advanced PLC and PAC instructions, like PID and user defined memory arrays and instructions. All along your adjectives should be to select subject most commonly used and those used in your equipment. The choices will be different for example you may be seeking advanced industrial automation training, or you may be seeking advanced building automation training.

The PID course we recommend below is a great example. Learning all 60 algorithms can be dry and you may never run into most of them. So the course below simplifies by providing the PID basics, like the 3 categories for PID algorithms (ideal, series/dependant and parallel/independent), then while teaching the most common algorithms, with interactive simulations, teaches you how to simplify PID tuning. This simplified approach will be adequate for most people in most circumstances.

- PID
- Intro to Python programming language
- Intro to SQL database queries

**PLC Components**

PLCs have grown throughout industrial control applications because of the ease they bring to creating a controller: ease of programming, ease of wiring, ease of installation, and ease of changing. All PLCs have the same basic components. These components work together to bring information into the PLC from the field, evaluate that information, and send information back out to various field. Without any of these major components, the PLC will fail to function properly. PLCs span a wide range of sizes, but all contain six basic components.

**Power supply**

**Input module**
**Output module**
**Processor (CPU)**
**Rack or mounting assembly**
**Programming unit (software)**
**Proportional Integral and Derivative PID Processor Module**

A PID module combines analog input, analog output, and a control program of a typical single loop controller. A PID module is a smart module. This means that it has an on-board microprocessor and program. The module carries out loop control without the use of the CPU in the PLC. These modules do communicate with the CPU for non-routine functions such as alarm reporting and programming changes.

**Controls and Indicators**

Most processor modules have front panel lights or indications to provide the user with status indications of PLC operation. These lights are very useful in troubleshooting. Also provided on most processor modules is a switch used to change the module mode of operation from RUN to PROGRAM. Additional connections are also usually provided to allow the connection of a terminal for programming the PLC and a port for connections to external I/O.

**Scanning**

The processor module controls the PLC by executing the software program. During program execution, the processor reads all the inputs and uses the values, in accordance with the control logic, to energize or de-energize the outputs, thus solving the ladder network. Once all the logic is solved, the processor updates all outputs. The process of reading the inputs, executing the program, and updating the outputs is known as a scan. The time required to make a single scan varies from 1 msec to 100 msec.

The scan is normally a continuous and sequential process of reading the status of inputs, evaluating the control logic, and updating outputs. The common scan method of monitoring the inputs at the end of each scan is inadequate for reading certain rapid inputs. Some PLCs provide software instructions that will allow the interruption of the continuous program scan to immediately receive an input or update an output. These immediate instructions are very useful when the PLC must instantaneously react to a critical input or output.

**User Program**

The user program memory is an area reserved in the application memory for the storage of the control logic. All the PLC instructions that control the machine or process are stored here. The addresses of inputs and outputs, whether real or internal, are specified in this section of memory. When the processor is in the run mode and the program is executed, the processor interprets the user program memory locations and controls the bits of the data table that correspond to real or internal outputs. The interpretation of the user program is accomplished by the processors execution of the executive program.

The maximum amount of available user program memory is normally a function of the processor size (i.e., I/O capacity). In medium and large controllers, the user program area is

normally flexible by altering the size of the data table so that it meets the minimum data storage requirements. In small processors, however, the user program area is normally fixed.

**Number Systems**

The earliest number or counting system known to man was developed to help determine a quantity for a collection of possessions. As daily activities became more complex, numbers became more important in trade, time, distance, and all other aspects of human life. Numbers are extremely important in everyday life. As such, a more complex system was required than counting everything on ones fingers and toes.

Ever since the necessity to count objects was discovered, man has been looking for easier ways to count them. The abacus, developed by the Chinese, is one of the earliest known methods for counting. The simple system of beads and wires arranged within a frame provided an early means for calculation. The apparatus proved helpful and is still used in some parts of the world today.

Computers are used wherever repeated calculations or the processing of large amounts of data is necessary. Some of the greatest applications are found in the military, scientific, and commercial fields. These fields have applications ranging from manufacturing processes to engineering design, to the identification and destruction of enemy targets. The advantages of digital computers include speed, accuracy, and labor savings. Often, computers are used to manage routine jobs, allowing personnel to perform other tasks, which may require a human touch.

People and computers normally do not speak the same language. However, methods of translating information into forms that are understood and used by both are necessary. Humans generally speak in words and numbers expressed in the decimal number system, while computers only understand coded electronic pulses that represent digital information.

**PLC Communication Protocols**

Today, most manufacturers of PLC systems have developed their own proprietary communication protocol, making it difficult to combine PLC components from different manufacturers. Communication protocols set the standards for data representation, signaling, authentication, and error detection required to send information over a communications channel. MODBUS is currently the most common protocol used by PLC manufacturers.