



**KLS'S GOGTE INSTITUTE OF TECHNOLOGY**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

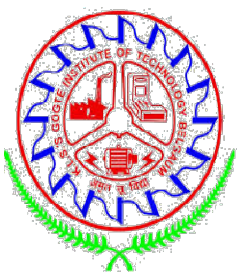


**CREINTORS AUTOMATION SOLUTIONS PVT.LTD.**

**PRESENTS**

# **HONOR'S PROGRAM IN PLC PROGRAMMING**





# Syllabus of Course

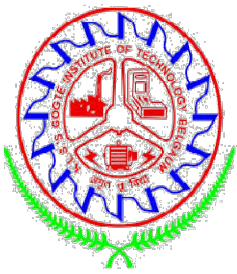


1. Basics of PLC

2. PLC Programming

3. SCADA Programming





# SCADA

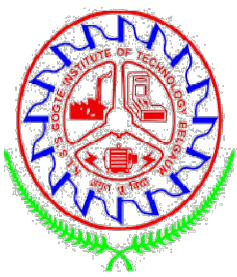


**SCADA means - Supervisory Control and Data Acquisition**

**SCADA stands for “Supervisory Control and Data Acquisition” . SCADA is a type of process control system architecture that uses computers, networked data communications and graphical Human Machine Interfaces (HMI) to enable a high-level process supervisory management and control.**

**SCADA systems gather pieces of information and data from a process which are analyzed in real-time (the “DA” in SCADA). It records and logs the data, as well as representing the collected data on various HMI. This enables process control operators to supervise (the “S” in SCADA) what is going on in the field, even from a distant location. It also enables operators to control (the “C” in SCADA) these process by interacting with the HMI.**

**SCADA systems are essential to a wide range of industries, and are broadly used for the controlling and monitoring of a process.**

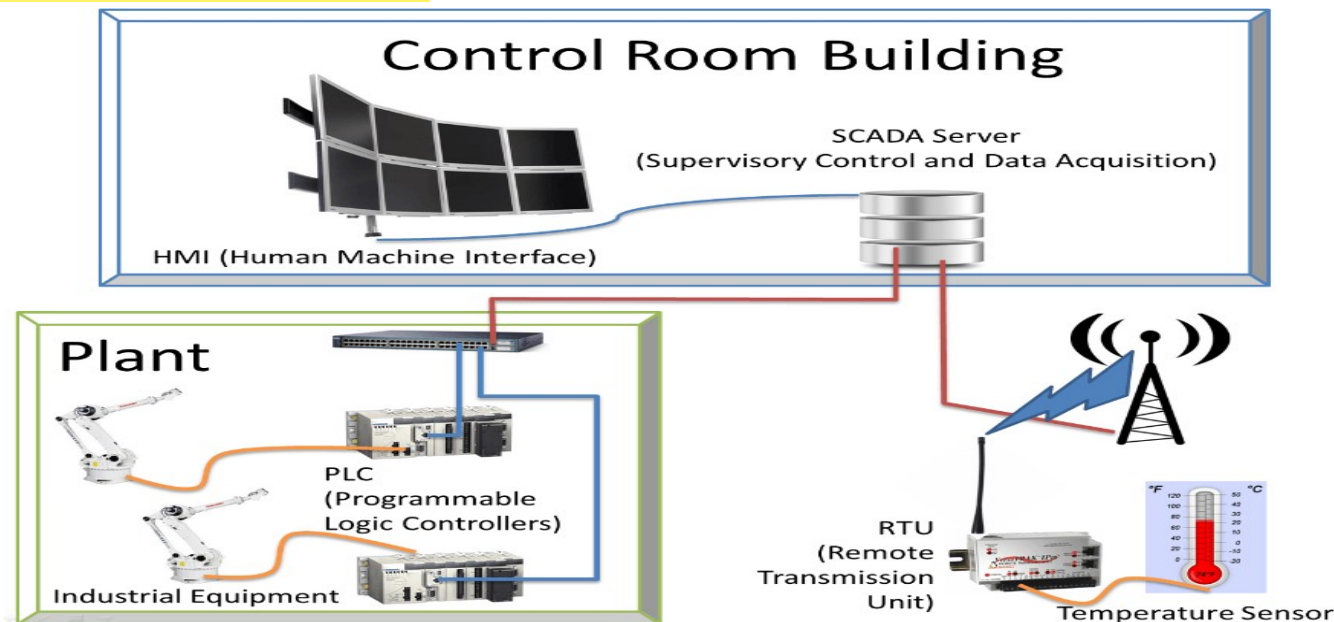


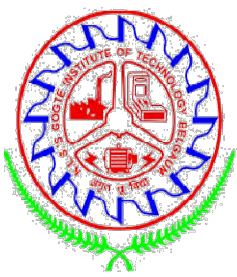
# SCADA



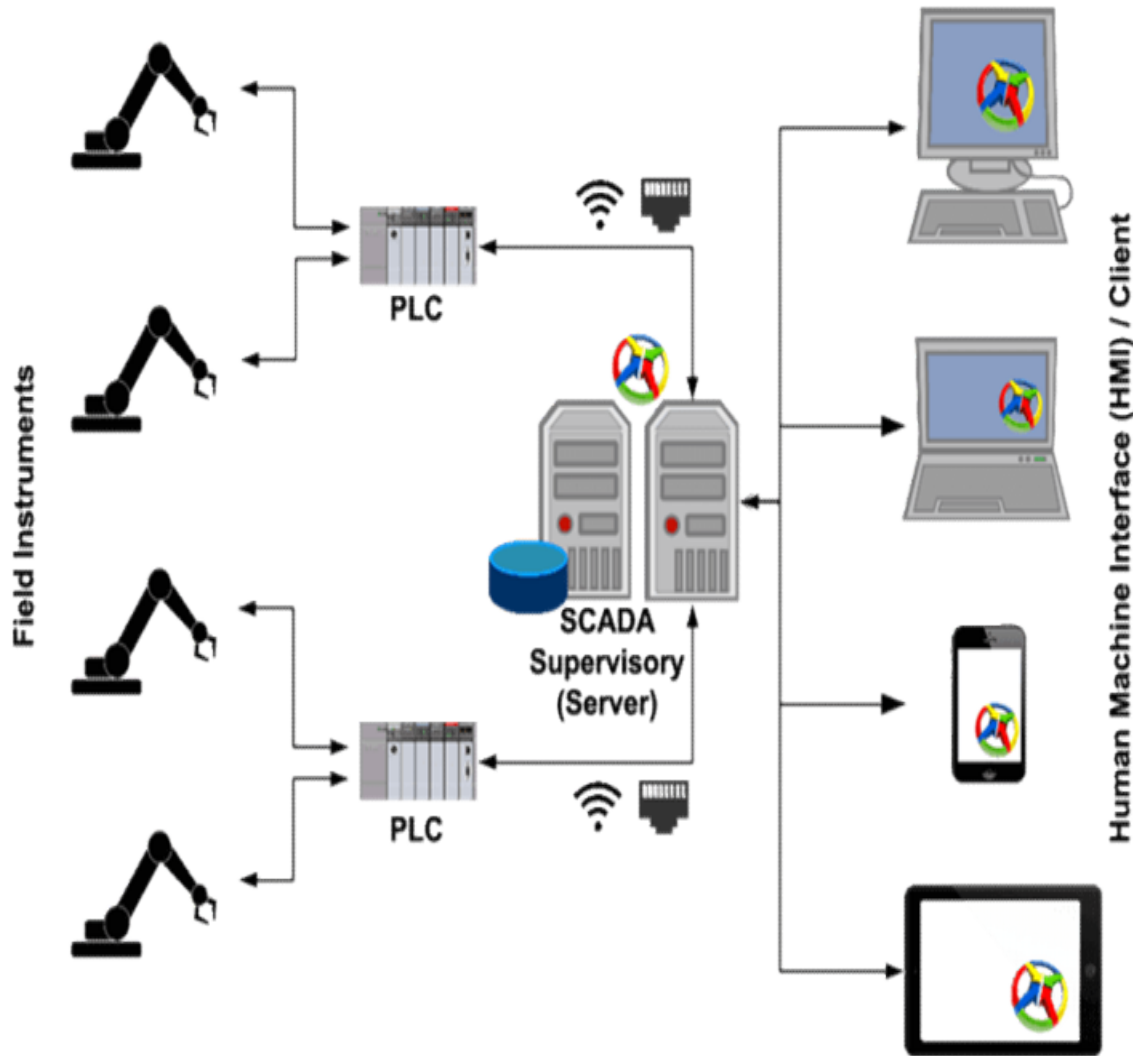
**SCADA allows the operator to keep a track of the entire process from his place or control room. Time can be saved by using SCADA efficiently.**

One such excellent example is, SCADA systems are **used extensively in the Oil and Gas sector**. Large pipelines will be used to transfer oil and chemicals inside the manufacturing unit. Hence, **safety plays a crucial role**, such that there should not be any leakage along the pipeline. In case, **if some leakage occurs, a SCADA system is used to identify the leakage**. It **infers the information, transmits it to the system, displays the information** on the computer screen and also **gives an alert to the operator**.



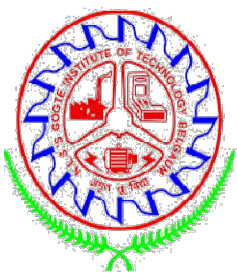


# SCADA Architecture



SCADA systems contain both hardware and software components. The computer used for analysis should be loaded with SCADA software. The hardware component receives the input data and feeds it into the system for further analysis. SCADA system contains a hard disk, which records and stores the data into a file, after which it is printed as when needed by the human operator. SCADA systems are used in various industries and manufacturing units like Energy, Food and Beverage, Oil and Gas, Power, Water, and Waste Management units and many more.





# SCADA History



**Earlier to the birth of SCADA, manufacturing floors and industrial plants relied on the manual control and monitor using push buttons and analog equipment.**

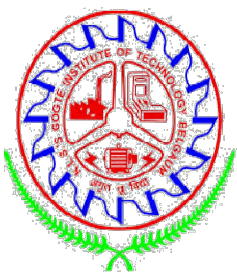
**As the size of the industries and manufacturing units grew in size, they started using relays and timers, that provided supervisory control to a certain extent. Unfortunately, relays and timers were able to solve problems only with minimal automation functionality and re configuring the system was difficult. So, a more efficient and fully automated system was required by all industries.**

**Computers were developed for industrial control purpose in the early 1950s.**

**Around the year 1970, the term SCADA was coined along with the evolution of Microprocessors and PLC concepts. So, this helped for the development of a fully automated system, that can be used remotely in Industry.**

**As years rolled by, in the early 2000s, distributed SCADA systems were developed.**

**Modern SCADA systems came into existence that allowed to control and monitor real-time data anywhere in the world.**



# SCADA Basics



## Objectives of SCADA

1. **Monitor:** SCADA systems continuously monitor the physical parameters
2. **Measure:** It measures the parameter for processing
3. **Data Acquisition:** It acquires data from RTU, data loggers, etc
4. **Data Communication:** It helps to communicate and transmit a large amount of data between MTU (Master Terminal Unit) and RTU (Remote Terminal units)
5. **Controlling:** Online real-time monitoring and controlling of the process
6. **Automation:** It helps for automatic transmission and functionality

The SCADA systems consist of hardware units and software units. SCADA applications are run using a server. Desktop computers and screens act as an HMI which are connected to the server.

The major components of a SCADA system include:

- a) **Master Terminal Unit (MTU)**
- b) **Remote Terminal Unit (RTU)** - used to transmit telemetry data to the supervisory system and receive the messages from the master system for controlling the connected objects.
- c) **Communication Network**



# Different Manufactures of SCADA



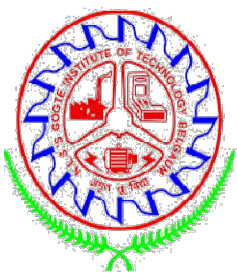
Following are the manufactures of SCADA software

1. Allen Bradley - FactoryTalk RS View32
2. Siemens - WinCC (Windows Control Center)
3. National Instruments - Labview.
4. Schneider - Wonderware Intouch.
5. Delta - DIAView - Delta Industrial Automation view
6. Elipse SCADA - Use for all the PLC

The SCADA comes with two types i.e.

1. Configurable / Works & Runtime - In this software you can develop and run the programme. The Licence software procured is life type.
2. Runtime - Only you can run the developed programme. Modifications/Additions is not possible.





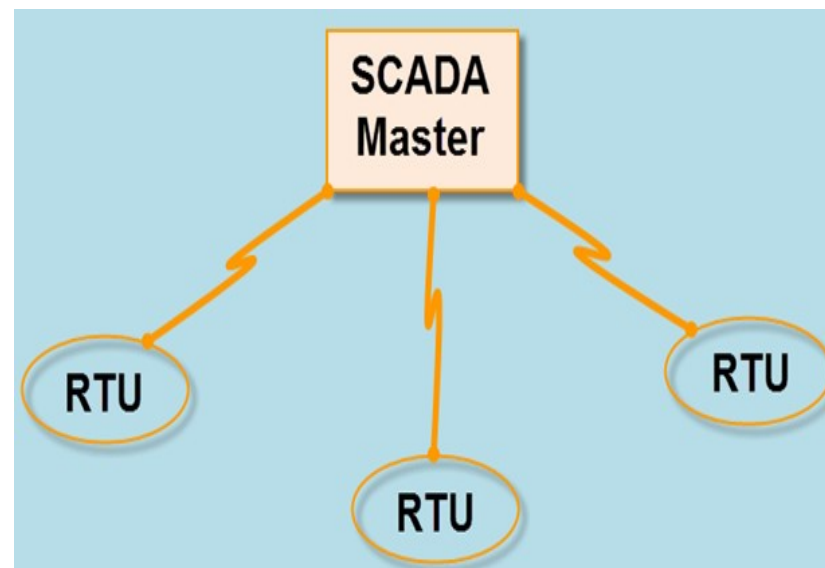
# Types of SCADA Systems

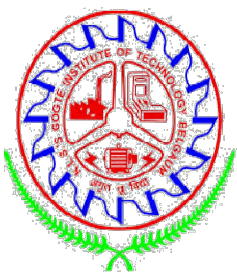


1. First Generation: Monolithic or Early SCADA systems,
2. Second Generation: Distributed SCADA systems,
3. Third Generation: Networked SCADA systems and
4. Fourth Generation: Internet of things technology, SCADA systems

## 1. Monolithic or Early SCADA Systems:

In earlier times, during the time of first generation, monolithic SCADA systems were developed wherein the common network services were not available. Hence, these are independent systems without having any connectivity to other systems.



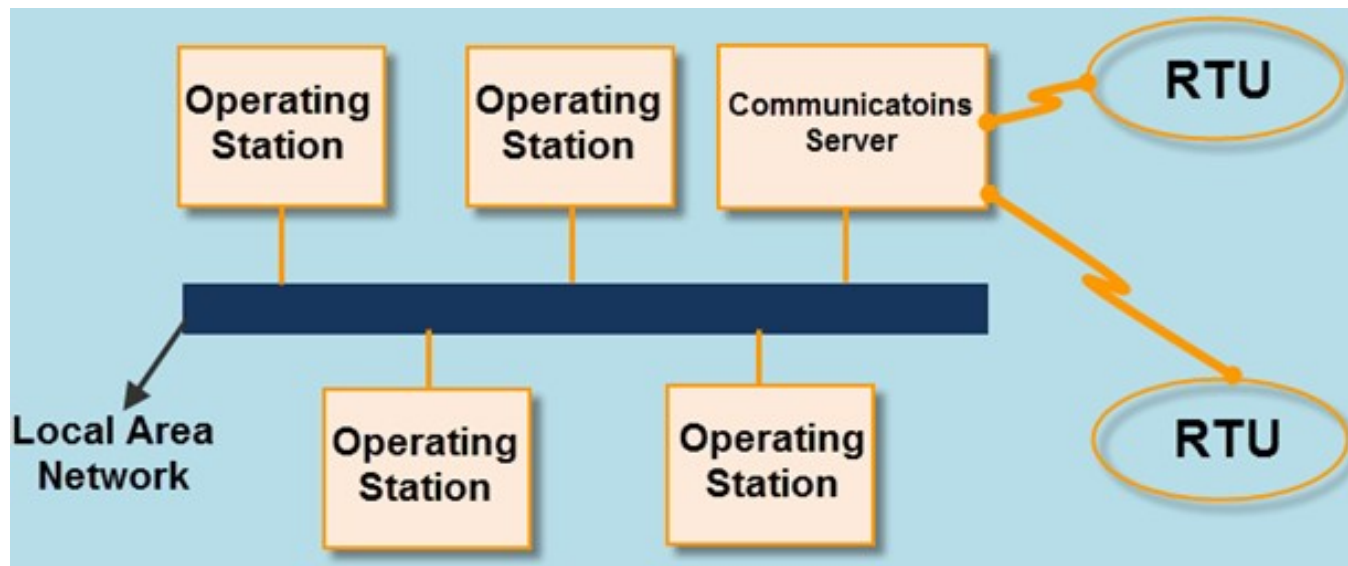


# Types of SCADA Systems



## 2. Distributed SCADA Systems:

In the second generation, the sharing of control functions and data is distributed across the multiple systems connected to each other using Local Area Network (LAN). Hence, these were termed as distributed SCADA systems. These individual stations were used to share real-time information and commands. The cost and size of the station were reduced compared to the first generation system, as each system of the second generation was responsible for performing a particular task with reduced size and cost.



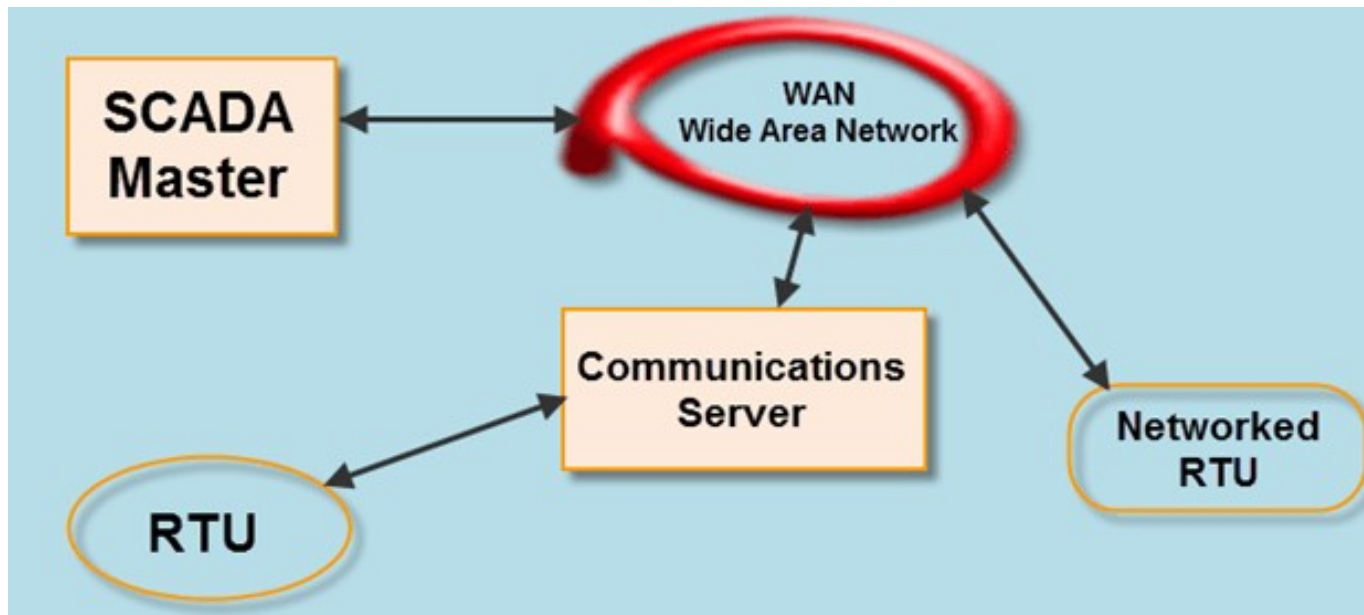


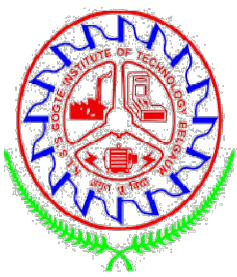
# Types of SCADA Systems



## 3. Networked SCADA Systems:

The current SCADA systems are generally networked which communicate using Wide Area Network (WAN) Systems over data lines or phone. These systems use Ethernet or Fiber Optic Connections for transmitting data between the nodes frequently. These third generation SCADA systems use Programmable Logic Controllers (PLC) for monitoring and controlling various parameters in the system.



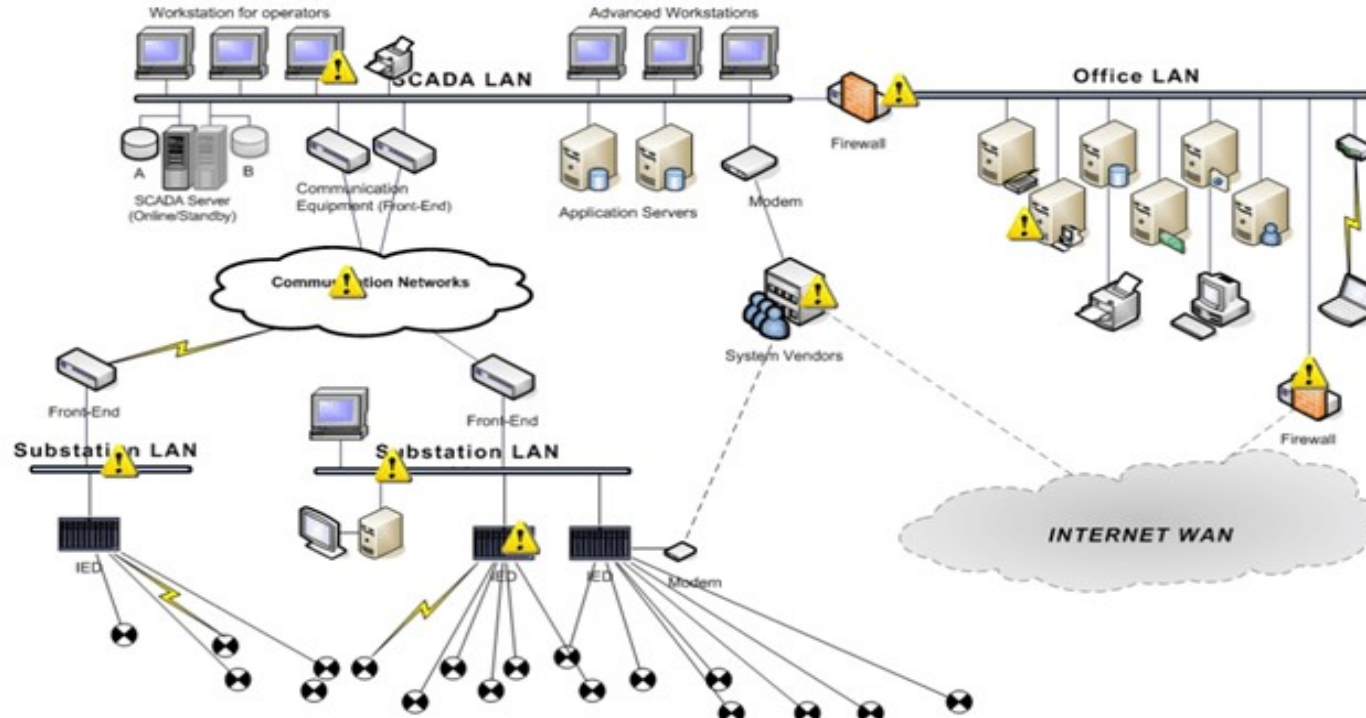


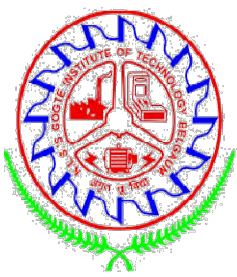
# Types of SCADA Systems



## 4. Internet of Things (IOT) SCADA systems:

In fourth generation, the cost of the SCADA systems is minimized by adopting the internet of things technology with cloud computing. The maintenance and integration is also very easy for the fourth generation compared to the earlier SCADA systems. These SCADA systems are able to report state in real time by using the cloud computing facility.





# SCADA tags



SCADA systems typically implement a distributed database, commonly referred to as a tag database, which contains data elements called tags or points. A point represents a single input or output value monitored or controlled by the system.

Tags are two types: Tag means variable value in computer language.

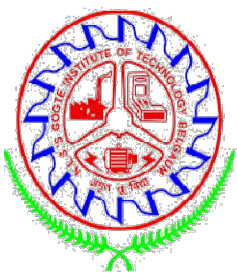
**1. System-defined Tags:** It represents the system value in the SCADA it is represented by dollar sign \$

**2. User-defined tags:** This tag is defined by the user or programmer. Except (A, S) are not defined

User will give the tags in Integer i.e. N7:0 to display the message or value.

If user wants to display the value in fraction the tags given in Floating i.e. F8:0 which will display the actual value in fraction.





# SCADA tags



## Classification of tags:

Direct tags

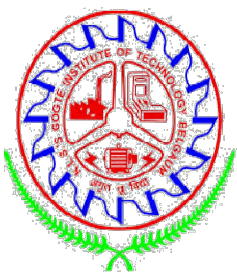
Indirect tags

### **Direct tags:**

These tags are directly used by the programmer to represent the value of plant or variable

### **Indirect tags:**

These tags are used by the programmer from other system to show or represent the value of plant or variable



# Allen Bradley SCADA



Allen Bradley comes with following SCADA software -

1. RSView32 - Old software work on tags based, which is now absolute.

Allen Bradley have come with new SCADA software on Screen basis i.e.

## 1. Factory Talk View SE - Factory Talk View Site Edition

Allen Bradley calls the SCADA as Works and Run time.

**Works** - for development and editing software that allows you to create an application.

**Runtime** - is the product that runs the application created by works software.



# Allen Bradley SCADA



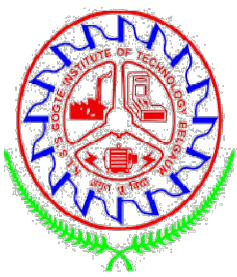
## Factory Talk View SE - Factory Talk View Site Edition (SCADA Software)

FactoryTalk® View Site Edition (SE) is a supervisory-level SCADA/HMI software for monitoring and controlling distributed-server/multi-user applications. It provides a comprehensive and accurate picture of operations, maintenance and operation informations.

The FactoryTalk View Site Edition Server stores SCADA/HMI project components like graphic displays and serves these components to clients. The server may also contain a database of tags, perform alarm detection, and manage historical data.

Following are the SCADA software available in Server/Works

1. FactoryTalk View Site Edition Server 25 Display with RSLinx
2. FactoryTalk View Site Edition Server 100 Display with RSLinx
3. FactoryTalk View Site Edition Server 250 Display with RSLinx
4. FactoryTalk View Site Edition Server Unlimited with RSLinx



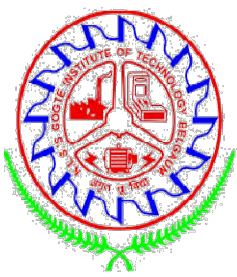
# Allen Bradley SCADA



Following are the SCADA software available in Run time

FactoryTalk View Site Edition Station - allows stand-alone (non-distributed) applications to run on a single computer.

1. FactoryTalk View Site Edition Station 15 Display
2. FactoryTalk View Site Edition Station 25 Display
3. FactoryTalk View Site Edition Station 100 Display
4. FactoryTalk View Site Edition Station 250 Display
5. FactoryTalk View Site Edition Station Unlimited Display



# Allen Bradley SCADA



## Factory Talk View ME - Factory Talk View Machine Edition (HMI Software)

FactoryTalk® View Machine Edition (ME) software is a versatile HMI application that provides a dedicated and powerful solution for machine-level operator and interface devices

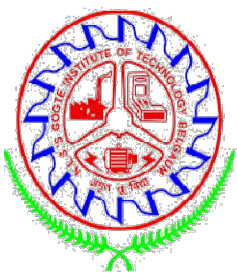
FactoryTalk View® Studio for FactoryTalk Machine Edition is configuration software for developing and testing machine-level human-machine interface (HMI) applications.

Software used - FactoryTalk View Studio for Machine Edition

HMI software available in Machine editions are -

1. FactoryTalk View Machine Edition Station Runtime 15 Displays
2. FactoryTalk View Machine Edition Station Runtime 30 Displays
3. FactoryTalk View Machine Edition Station Runtime 75 Displays
4. FactoryTalk View Machine Edition Station Runtime 250 Displays
5. FactoryTalk View Machine Edition Station Runtime 500 Displays





# Allen Bradley HMI



## PanelView Component Graphic Terminals

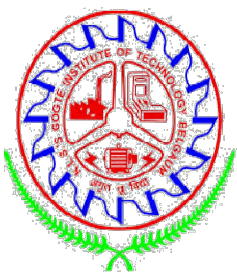
HMI available with following screen dimensions -



2 Inch / 3 Inch / 4 Inch / 6 Inch

with Function Key / Numeric and Function Key /  
Touch Screen

These models are discontinued and not  
available



# Allen Bradley HMI



## PanelView 800 HMI - 3 models available

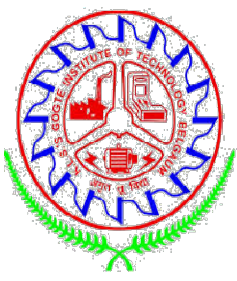


1. PanelView 800, 4.3 in HMI Terminal, Touch Screen TFT, Serial and Ethernet ports
2. PanelView 800, 7 in HMI Terminal, Touch Screen TFT, Serial and Ethernet ports
3. PanelView 800, 10 in HMI Terminal, Touch Screen TFT, Serial and Ethernet ports

## PanelView Plus 6 Compact Graphic Terminals



1. PanelView Plus 6 Compact Terminal, Keypad/Touch Input Type, 3.5/5.7 in Display Size, Color Display Type, Ethernet and RS232 communication, DC Power Input
2. PanelView Plus 6 Compact Terminal, Keypad/Touch Input Type, 3.5/5.7 in Display Size, Gray scale Display Type, Ethernet and RS232 communication, DC Power Input



# Allen Bradley HMI



## PanelView Plus 7 Graphic Terminals



PanelView Plus 7 Graphic Terminal Keypad/Touch Input Type, 4 - 19 in Display Size, Color Display Type, Ethernet and RS232 communication, DC Power Input

SD card facility to store the screens in HMI

A black and white photograph of a perforated metal surface, possibly a grate or a screen. The surface is covered with a grid of small, circular holes. The lighting is dramatic, with strong highlights and deep shadows, creating a textured appearance. The text "THANK YOU" is overlaid in the center in a bold, white, sans-serif font.

**THANK YOU**