Control System

Lecture 1
Introduction
&
Basic Terminologies

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System

System - a set of connected things or devices that operate together to achieve certain objective.

It is the medium through which an input is converted into output.
For example:

- A central Air conditioning system
- A set of computer equipment and programs used together for a particular purpose.

- A set of organs or structures in the body that have a particular purpose.

- The immune system
- The nervous system

Other example includes

- Transportation system.
- Whether forecasting system.

Control

- A device or mechanism used to regulate or guide the operation of a machine, apparatus, or system.

  For example

- The controls of the aircraft.
- Temperature control of air conditioning system.

Control System

Control System = Control + System

- Control System - It is an amalgamation of different physical elements in such a way so as to regulate, direct or command itself to achieve a certain objective.
- A control system must have (i) input, (ii) output (iii) Ways to obtain input and output objectives, and (iv) control action.

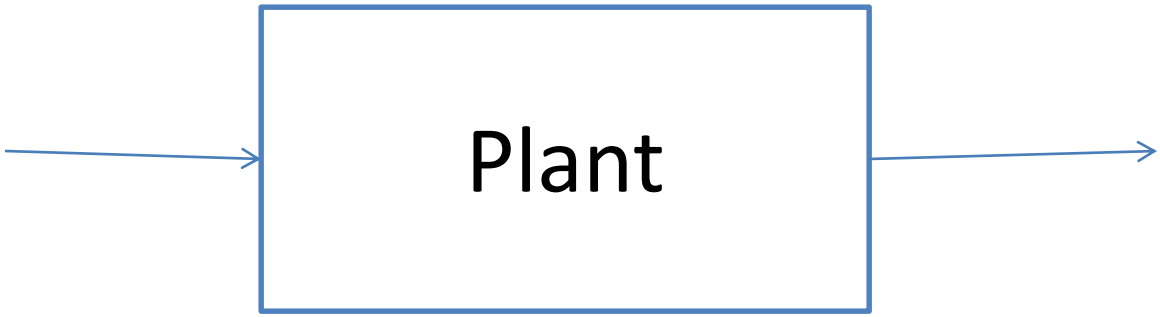
Basic terminologies in control system

- **System:** A combination or arrangement of a number of different physical components to form a whole unit such that that combining unit performs to achieve a certain goal.
- **Control:** The action to command, direct or regulate a system.
- **Control system:** A system that can command, direct or regulate itself or another system to achieve a certain goal.

Input: It is the signal or excitation supplied to a control system.

Output: It is the actual response obtained from the control system.

Plant or process: The part or component of a system that is required to be controlled



Controller: The part or component of a system that controls the plant.

Disturbances: The signal that has adverse effect on the performance of a control system.

Automation: The control of a process by automatic means.

Actuator: It is the device that causes the process to provide the output. It is the device that provides the motive power to the process.

Design: The process of conceiving or inventing the forms, parts, and details of system to achieve a specified purpose.

Simulation: A model of a system that is used to investigate the behavior of a system by utilizing actual input signals.

Optimization: The adjustment of the parameters to achieve the most favorable or advantageous design.

Feedback Signal: A measure of the output of the system used for feedback to control the system.

Negative feedback: The output signal is feedback so that it subtracts from the input signal.

Block diagrams: Unidirectional, operational blocks that represent the transfer functions of the elements of the system.

Open-loop control system: A system that utilizes a device to control the process without using feedback. Thus the output has no effect upon the signal to the process.

Closed-loop feedback control system: A system that uses a measurement of the output and compares it with the desired output.

Regulator: The control system where the desired values of the controlled outputs are more or less fixed and the main problem is to reject disturbance effects.

Servo system: The control system where the outputs are mechanical quantities like acceleration, velocity or position.

Trade-off: The result of making a judgment about how much compromise must be made between conflicting criteria.