



Control Systems

Subject Code: BEC-26

Third Year ECE

Unit-I

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Lecture 1

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UNIT- I

UNIT-I: Basic Components of a control system, Feedback and its effect, Types of feedback control Systems, Block diagrams: representation and reduction, Signal Flow Graphs, Modeling of Physical Systems: Electrical Networks and Mechanical Systems, Force-voltage analogy, Force-current analogy.

- Introduction to Control Systems
 - ❖ Control System – Definition and Practical Examples
 - ❖ Basic Components of a Control System
- Feedback Control Systems:
 - ❖ Feedback and its Effect
 - ❖ Types of Feedback Control Systems
 - ❖ Transfer Function
- Block Diagrams:
 - ❖ Representation and reduction
 - ❖ Signal Flow Graphs
- Modeling of Physical Systems:
 - ❖ Electrical Networks and Mechanical Systems
 - ❖ Force-Voltage Analogy
 - ❖ Force-Current Analogy



Course Assessment methods:

Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and Three Minor tests and One Major Theory & Practical Examination

Course Outcomes:

The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course,

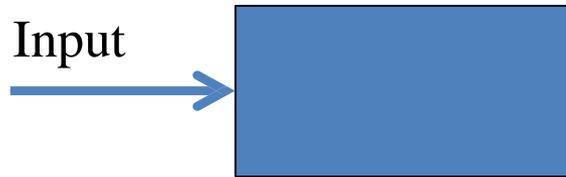
- ✓ Describe the response characteristic and differentiate between the open loop and closed loop of a control system.



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Input



- The stimulus or excitation applied to a control system from an external source in order to produce the output is called input

Output



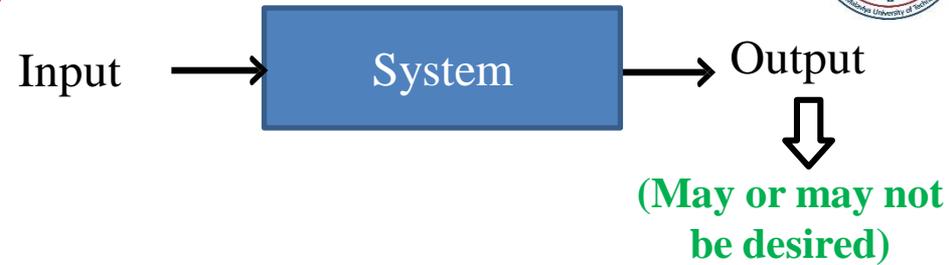
- The actual response obtained from a system is called as output.



Control

- It means to regulate, direct or command a system so that the desired objective is attained

System



- It is a combination or arrangement of different physical components connected or related in such a manner so as to form an entire unit to attain a certain objective.

Combining above definitions

System + Control = Control System

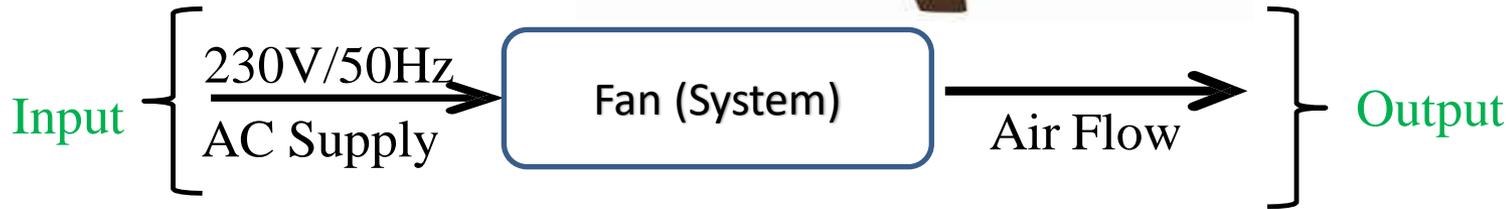
Control System:



- A control system is an arrangement of different physical elements connected in such a manner so as to regulate, direct, command itself or some other system to achieve a certain objective.

Difference between System and Control System

➤ An example : Fan



➤ **A Fan: Can't Say System:** A Fan without blades cannot be a “SYSTEM”
Because it cannot provide a **desired/proper** output. **i.e. airflow**



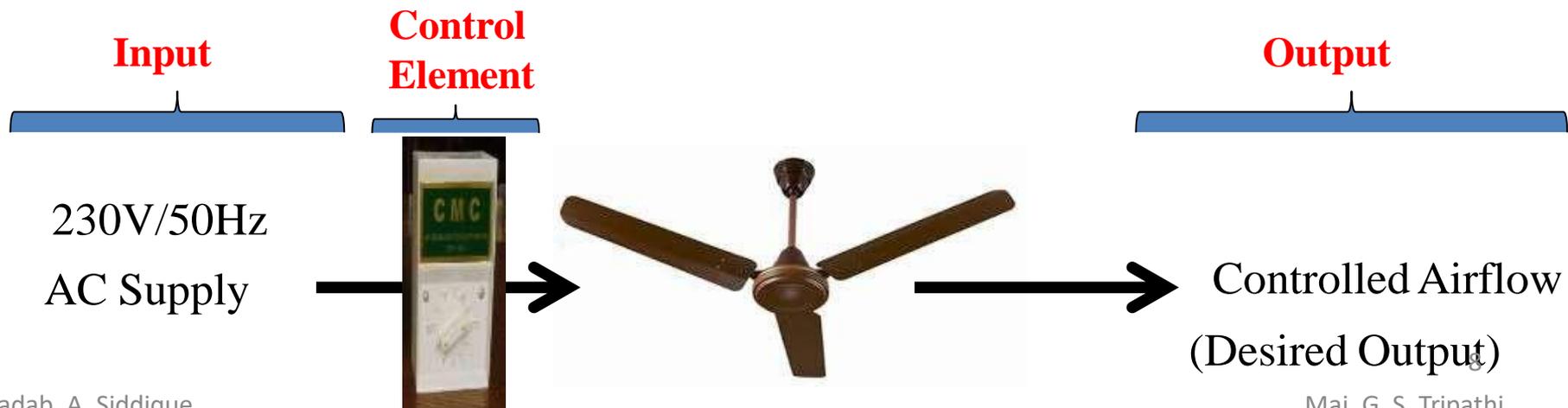
A Fan: Can be a System

- A Fan with blades but without regulator can be a “SYSTEM” Because it can provide a **proper output**. i.e. airflow
- But it cannot be a “Control System” Because it cannot provide desired output i.e. controlled airflow



A Fan: Can be a Control System

- A Fan with blades and with regulator can be a “CONTROL SYSTEM” Because it can provide a **Desired output**. i.e. Controlled airflow

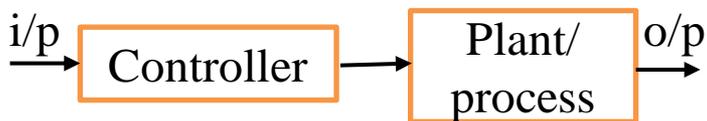




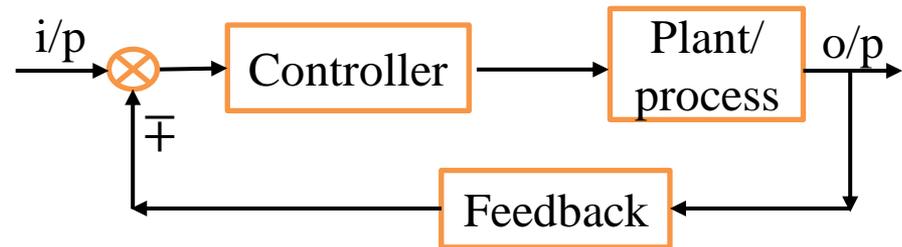
Classification of Control System:

Control system can be broadly classified as-

1. Natural control system e.g: Respiratory system, Biological systems of human body
2. Man-made control system e.g: Vehicle
3. Combination control system e.g: Driving a car
4. Time variant and Invariant control system
5. Linear and Nonlinear control system
6. Continuous time and Discrete time control system
7. Deterministic (o/p is predictable) and stochastic (o/p is unpredictable) control system
8. Lumped parameter and Distributed parameter control system
9. SISO (Serial input serial output) and MIMO (Multiple input and multiple output) control system
10. Open loop and Closed loop control system



Open Loop Control System



Closed Loop Control System