

## Introduction to Control Systems

The **main purpose** of a **control system** is to **improve** the **performance** of some process. In engineering, these processes are usually mechanical, fluid, thermal, electrical, aerodynamic, structural, or chemical. The improvement of the process is measured by system specifications such as accuracy, speed, reliability, etc. A well-controlled system performs within its design specifications. So, for example, the speed control system of an automobile should control the speed to within a few miles per hour under reasonable driving conditions.

Some processes are **relatively simple**, and the systems needed to control them can be designed using **trial-and-error**. For more **complex processes**, however, a more sophisticated design approach is necessary. This approach is based on developing **mathematical** (numerical) **models** that describe how the process and its associated components respond. Mathematical models can be based on experimental observations or on known physical principles.

The **mathematical models** are then used in the **design process** to find **controller characteristics** that will provide good overall system performance. The chart below shows how these procedures are used in the design process that leads to controller implementation. The blocks in yellow highlight the areas addressed in these notes on Introductory Control Systems.

