

# **Introduction to Model Predictive Control (MPC)**

## **Course Description:**

This course offers a comprehensive introduction to Model Predictive Control (MPC), exploring various models, state feedback, stability, and optimality concepts. You will gain insights into both basic and constrained MPC techniques, learning how to apply these methods to control systems effectively. The course aims to equip you with the necessary tools and methodologies for understanding and implementing MPC in different applications, focusing on stability, optimality, and real-time constraints.

## **Audience Profile:**

- Control engineers
- Automation professionals
- System designers
- Graduate students in control systems
- Researchers interested in advanced control techniques

## **Prerequisites:**

- Basic understanding of control systems
- Familiarity with state-space representation
- Basic knowledge of linear algebra and optimization

## **Course Objectives:**

- Understand the fundamentals of Model Predictive Control (MPC)
- Explore different models and their significance in control systems
- Learn how to design and implement basic MPC with state feedback
- Analyze stability and optimality in MPC
- Gain insights into constrained MPC and its applications

## Table of Contents:

- **Lecture 1:** Introduction to MPC  
Overview of Model Predictive Control, key principles, and applications.
- **Lecture 2:** Introduction to Different Models  
Exploration of various models used in control systems and their impact on MPC.
- **Lecture 3:** Basic MPC and State Feedback  
Techniques for designing basic MPC and implementing state feedback control.
- **Lecture 4:** Stability and Optimality  
In-depth analysis of stability and optimality in MPC, ensuring robust control systems.
- **Lecture 5:** Constrained MPC  
Introduction to constraints in MPC, addressing real-world applications with restrictions.