

Nirma University
School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)

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Course Code	2ICDE55
Course Title	Advance Process Control

Course Learning Outcome:

At the end of the course, students will be able to –

- select the best pair of controlled-manipulating variable of (MIMO) process and design decoupler for MIMO process control
- analyse and design IMC based controller and Model Predictive Control
- interpret working of various types of adaptive control system and statistical process control
- analyse various optimization techniques

Syllabus

**Teaching
Hours**

UNIT 1: Introduction to Advanced Process Control

Importance of advanced Process Control strategies, need of advance process control

01

UNIT 2: Multivariable Control Systems

MIMO examples, Interaction in multivariable system, Design of decouplers, Relative Gain Array (RGA), Singular Value Analysis (SVA), strategies for reducing control loop interactions.

06

UNIT 3: Model Predictive Control

Overview, Prediction for SISO and MIMO systems, Selection of design and tuning parameters. Implementation of MPC, Dynamic Matrix Control (DMC)

06

UNIT 4: Internal Model Control

Internal model principle, IMC design procedure, Model uncertainty and disturbances, IMC based PID procedure and implementations.

03

UNIT 5: Statistical Process Control

Concept of SPC, SPC based control strategies and implementation of SPC for various examples.

03

UNIT 6: Adaptive Control Systems **05**

Need for adaptive control, Types of adaptive control, Design of adaptive control, implementation issues of adaptive control strategy

UNIT 7: Optimization Techniques **06**

Basic requirements in optimization, unconstrained and constrained optimization techniques, linear programming, quadratic and nonlinear programming.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will consist of minimum 10 experiments based on the above syllabus.

References:

1. G. Stephanopolous, Chemical Process Control, PHI Publication
2. Seborg, Edgar and Mellichamp, Process Dynamics and Control. Wiley India Publication
3. B.Wayne Bequette, Process Control, PHI Publication