

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

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<b>Course Code</b>	<b>2EIDE55</b>
<b>Course Title</b>	<b>Advance Process Control</b>

**Course Outcomes (CO) :**

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**

*D. Adhikari*

### **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**

Need for adaptive control, Types of adaptive control, Design of adaptive control, implementation issues of adaptive control strategy 05

### **UNIT 7: Optimization Techniques**

Basic requirements in optimization, unconstrained and constrained optimization techniques, linear programming, quadratic and nonlinear programming. 06

#### **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

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