

Industrial Process Control [IPC]

B.E. Sem. VII [INST]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Introduction

Review of all strategies for process control, SISO, MIMO, ISA symbols.

2. Control System for Heat transfer unit operations

Heat exchangers : classification as per fluid flow arrangement and construction, feedback, feed-forward, bypass control. *Furnace control* : Start-up heaters, fired re-boilers, process and safety controls. *Evaporator control* : Types of Evaporator and multiple effect evaporator, control systems for Evaporator including selective control, steady state model for Evaporator. *Boiler controls* : Temperature and Pressure control of steam, Combustion control, Drum level control, Furnace draft control, safety interlocks and Burner Management System.

3. Control System for Heat and mass transfer unit operations

Distillation column : Basic principle, Batch and continuous distillation, accessories, Distillation column control strategies. *Crystallizers* : Super-saturation methods, Process of crystallization, types of crystallizer, control of evaporating crystallizer, cooling crystallizers, vacuum crystallizers. *Dryer control* : Process of drying, types of dryer- Tray, fluidized bed, rotary, and spray, and their control strategies. *Reactor control* : Reactor characteristics, runaway reaction, various schemes of temperature control of reactors.

4. Control system for compressor

Classification, Phenomenon of Surge, Methods of capacity control for compressors.

5. Process control for Industries

Continuous Process Industries : Refinery Industry: Process flow diagram, separation, treatment-Hydro-desulphurization unit, conversion methods- Fluid Catalytic Cracking, blending. *Iron and steel Industry* : Process flow diagram, its Instrumentation. *Batch Process Industries* : Overview of food processing & pharmaceutical industries and the same to be studied with reference to following aspects (a) Charging of Raw Materials, (b) Heating/cooling using different utilities, (c) Milti product recipe management, (d) Reports.

6. Safety in Instrumentation control systems

Area and material classification as per IEC and NEC standard, techniques used to reduce explosion hazards, intrinsic safety, and installation of intrinsically safe systems.

Reference :

1. Unit operation and chemical engineering (*W.L.McCabe and Julian Smith*) Tata McGrawHill- fifth edition.
2. Instrument engineers handbook- Process control (*Bela G. Liptak*) Chilton book company- 3rd edition.
3. Instrumentation in the processing industries (*Bela G. Liptak*) Chilton book company-1st edition.
4. Complete Control of Processes (*M. Chidambaram*) Narosa Publishing House.
5. Process industrial instruments and controls handbook (*Douglas M. Concidine*) Mc-GrawHill- 4th edition.
6. Shreve's chemical process industries (*George T. Austin*) Mc-GrawHill- fifth edition.
7. Chemical process control (*George Stephenopoulos*) PHI-1999.
8. Power Plant control and instrumentation – control of boilers HRSG (*David Lindsey*) Institution of Engineering and Technology.
9. Boiler Control Systems Engineering (*G.F. Gilman*) 2005, ISA Publication.

