C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: Technology & Engineering
DEPARTMENT OF: Instrumentation & Control Engineering
SEMESTER: VII
CODE: 4TE07APC1
NAME: Advanced Process Control

Teaching & Evaluation Scheme

Subject Code	Subject Name	Teaching Hours/Week				Credits	Evaluation Scheme/Semester							Total Marks
							Theory				Practical			
							Sessional Exam		University Exam		Internal		University	
		Th	Tu	Pr	Total		Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE07APC1	Advanced Process Control	4	0	2	6	5	30	1.5	70	3	--	20	30	**150**

OBJECTIVES:

1. To acquaint the students with Advanced Control Strategies**.**

PREREQUISITES:

1. Basics of Process Control

COURSE OUTLINES:

Sr. No.	Course Contents	No Of Hours
1	**INTRODUCTION:** Review of basics of Process Control, Control objective and benefits, Control system elements. MIMO systems, Nonlinearity in process, Limitation of Normal feedback loop, Modeling of basic processes.	6
2	**NONLINEAR ELEMENTS IN LOOP:** Limiters, Dead Zones, Backlash, Dead Band, Velocity Limiting, Negative Resistance. **IMPROVEMENT IN NONLINEAR PROCESS PERFORMANCE:** Deterministic Control Loop Calculations, Calculations of the measured variable, final control element selection, cascade control design, Real time implementation issues multiple-output systems.	8
3	**THE ADVANCE CONROL STRATEGIES:** Cascade control, Feed forward control, feedback-feedforward control, Ratio control, Selective Control , Split range control- Basic principles, Design Criteria , Performance, Controller Algorithm and Tuning, Implementation issues, Examples and any special	8

	features of the individual loop and industrial applications	
4	**MULTIVARIABLE CONTROL:** Concept of Multivariable Control: Interactions and its effects, Modeling and transfer functions, Influence of Interaction of the possibility of feedback control, important effects on Multivariable system behavior Relative Gain Array, effect of Interaction on stability and Multiloop Control system. Multiloop control Performance through: Loop Paring, tuning, Enhancement through Decoupling, Single Loop Enhancements.	10
5	**ADAPTIVE CONTROL FOR SINGLE LOOP SYSTEM:** Analyzing Non-linear process with linear feedback control, Improving nonlinear process performance through: Deterministic loop calculations, Calculation of measured variable, Final Element selection, Cascade design. Real time implementation issues.	8
6	**INTELLIGENT CONTROLLERS:** Step analysis method for finding first, second and multiple time constants and dead-time. Model Based controllers: Internal Model control, Smith predictor, optimal controller, Model Predictive controller, Dynamic matrix controller (DMC). Self Tuning Controller.	10
7	**Statistical Process Control (SPC):** Concept, Design procedure.	2

Learning Outcomes:
   1. After studying this course the students would be able to design controllers based on advanced control techniques.

BOOKS RECOMMENDED:

1. Donald Eckman – Automatic Process Control, Wiley Eastern Limited
2. Thomas E Marlin - Process Control- Designing processes and Control Systems for Dynamic Performance, McGraw-Hill International Editions.
3. Process Control Systems-F.G.Shinskey, TMH.
4. Handbook of Instrumentation -Process control –B.G.Liptak, Chilton.