



C.U.SHAH UNIVERSITY

FACULTY OF: Technology & Engineering
DEPARTMENT OF: Electrical Engineering
BRANCH OF: Electrical Engineering.
SEMESTER: V
COURSE: B.Tech
SUBJECT CODE: 4TE05LCT1
SUBJECT NAME: LINEAR CONTROL THEORY

Teaching & Evaluation Scheme

Subject Code	Subject Name	Teaching Hours/Week				Credits	Evaluation Scheme/Semester							
		Th	Tu	Pr	Total		Theory				Practical			Total Marks
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE05LCT1	LINEAR CONTROL THEORY	4	0	2	6	5	30	1.5	70	3	--	20	30	150

OBJECTIVES:

1. To introduce the students to the concepts of control systems and its design.
2. The course presents theory and methodology for analysis and modelling of systems and signals and methods for design and synthesis of feedback controllers.

PREREQUISITES:

1. Basics of Applied Mathematics.

COURSE OUTLINES:

Sr. No.	Course Contents	No of Hours
1	Introduction to Control Systems: Introduction, Examples of Control Systems, Closed-loop Control versus Open-Loop Control	04
2	Mathematical Modelling of Dynamic Systems: Introduction, Transfer Function and Impulse-Response Function, Automatic Control Systems, Modeling in state Space, State-Space Representation of Dynamic Systems, Transformation of Mathematical Models with MATLAB, Mechanical Systems, Electrical and Electronic Systems, Signal Flow Graphs, Linearization of Nonlinear Mathematical Models	08
3	Mathematical Modelling of Fluid Systems and Thermal systems: Introduction, Liquid-Level Systems, Thermal Systems	06

4	Transient and Steady-State Response Analyses: Introduction, First-Order Systems, Second-Order Systems, Higher-Order Systems, Transient-Response Analysis with MATLAB, Routh's Stability Criterion, Effects of Integral and Derivative Control Actions on System Performance, Steady-State Errors in Unity-Feedback Control Systems	08
5	Root-Locus Analysis: Introduction, Root-Locus Plots, General Rules for Constructing Root Loci, Root-Locus Plots with MATLAB, Positive Feedback Systems, Conditionally Stable Systems, Root Loci for Systems with Transport Lag	12
6	Frequency-Response Analysis: Introduction, Bode Diagrams, Plotting Bode Diagrams with MATLAB, Polar Plots, Drawing Nyquist Plots with MATLAB, Log-Magnitude-versus-Phase Plots, Nyquist Stability Criterion, Stability Analysis, Relative Stability, Closed-Loop Frequency Response of Unity-Feedback Systems	12

Learning Outcomes:

After the completion of this course the students would be able to:

1. Design basic control systems with multiple inputs and outputs.
2. Understand basic properties of multivariable linear systems, such as multivariable poles, zeros, system gains and associated critical input and output directions.

Books Recommended:

1. Modern Control Engineering by Katsuhiko Ogata, 4th Edition, Prentice Hall of India. (Unit I,II,III,IV,V,VI)
2. Nagrath I.J., and Gopal, M., "Control system Engineering" Wiley Eastern
3. Gopal. M., "Modern control system Theory", Wiley Eastern Ltd