

# GUJARAT TECHNOLOGICAL UNIVERSITY

B.E Semester: 4

## Instrumentation and Control Engineering

Subject Code 141701

Subject Name Control Theory

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Sr.No	Course Content
1	Introduction to Control Systems: Introduction, Examples of Control Systems, Closed-loop Control versus Open-Loop Control
2	Mathematical Modeling 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
3	Mathematical Modeling of Fluid Systems and Thermal systems: Introduction, Liquid-Level Systems, Thermal Systems
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
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
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

### Reference Books:

1. Modern Control Engineering by Katsuhiko Ogata, 4<sup>th</sup> Edition, Prentice Hall of India.
2. Automatic Control Systems by Benjamin C.Kuo, 8<sup>th</sup> Edition, Farid Golnaraghi, John Wiley & Sons.