

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Instrumentation and Control Engineering

(Applied Instrumentation)

Subject Name: CONTROL ENGINEERING

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Sr.No	Course content
1.	<p>Stability :</p> <p>Equilibrium Points , Stability Concepts and Definitions , Stability of Linear Time-Invariant Systems , Equilibrium Stability of Nonlinear Continuous-Time Autonomous Systems , The Direct Method of Liapunov and the Linear Continuous-time Autonomous System , Aids to finding Liapunov Functions for Nonlinear Continuous-Time Autonomous Systems , Use of Liapunov Functions to Estimate Transients , The Direct Method of Liapunov and the Discrete-Time Autonomous System.</p>
2.	<p>Model Control :</p> <p>Controllable and Observable Companion Forms , The Effect of State Feedback on Controllability and Observability , Pole Placement by State Feedback , Full-Order Observers , Reduced-Order Observers , Deadbeat Control by State Feedback , Deadbeat Observers.</p>
3.	<p>Optimal Control (General Mathematical Procedures) :</p> <p>Formulation of the Optimal Control Problem, Calculus of Variations , Minimum Principle , Dynamic Programming , Numerical Solution of Two-Point Boundary Value Problem.</p>
4.	<p>Optimal Feedback Control :</p> <p>Discrete-Time Linear State Regulator , Continuous-Time Linear State Regulator , Time-Invariant Linear State Regulators , Numerical Solution of the Riccati Equation , Use of Linear State Regulators Results to Solve Other Linear Optimal Control Problems , Suboptimal Linear Regulators , Linear Regulators with Low Sensitivity , Minimum-Time Control of Linear Time-Invariant Systems</p>
5.	<p>Stochastic Optimal Linear Estimation and Control :</p> <p>Stochastic Processes and Linear Systems , Optimal Estimation for Linear Continuous-time Systems , Optimal Estimation for Linear Discrete-Time Systems , Stochastic Optimal Linear Regulator</p>

### Reference Books:

1. Modern Control System Theory, 2<sup>nd</sup> Edition by Dr. M.Gopal , New Age International Publishers
2. Automatic Control Systems , 7<sup>th</sup> Edition by Benjamin C. Kuo , PHI