

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	ECE-604	Control System	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Explain the concept for modeling of physical systems in open loop and closed loop.
CO2	Describe the characteristics of first-order and second-order control systems
CO3	Describe the concept of stability in the context of Routh-Hurwitz stability criterion & Root locus
CO4	Analyze system stability in the frequency domain using Bode plots and Nyquist diagrams.
CO5	Analyze state space approach for discrete-time systems.

Detailed Syllabus**Section-A**

Unit 1: Control systems, types of control systems, feedback and its effects, mathematical modeling of physical systems, block diagrams, representation of control systems, transfer functions, signal flow graphs, Mason's gain formula **(8 Hrs)**

Unit 2: Time domain analysis of control systems: time domain analysis of first and 2nd order control systems, standard test signals, typical test signals for time response of control systems, time domain performance of first and second order control. Steady state errors and error constants, design specification of 2nd order & higher order systems. **(10 Hrs)**

Unit 3: Stability analysis time domain: The concept of stability, necessary conditions for stability, Stability characteristic equation, stability of linear time invariant systems, Routh-Hurwitz stability Criterion, the root locus concept, construction of root loci, root counters, Root locus plot, **(9 Hrs)**

Section-B

Unit 4: Stability analysis frequency domain: Correlation between time domain & frequency domain, all pass and minimum phase systems, Bode plot, Polar Plot, determination of transfer function using bode plot, Nyquist Criterion, Design specifications in time domain and frequency domain, phase lead, and phase lag design using Bode-plot, Introduction to P, PI and PID controllers, tuning of PID controllers. **(10 Hrs)**

Unit 5: State Space Analysis: Concepts of state, state variable, state space models, state space analysis, state model for linear continuous time systems, controllability and observability analysis, effect of pole zero cancellation on the controllability and observability. **(8 Hrs)**

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Modern Control System	K. Ogatta	McGraw Hill Education	5th (2010)
2	Control System Engineering	Nagrath and Gopal	New Age International	5th (2016)

Reference Book

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Linear Control System	B. S. Manke	Khanna	12th (2016)