



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3730713

Semester – III

ELECTRICAL ENGINEERING

Subject Name: Dynamics of Linear Systems

Type of course: Program Elective V

Prerequisite: Control Theory

Rationale: The power systems contains many linear controllers, for control of various variables like frequency, voltage etc. The understanding of working and design of these controllers is very important. The stability assessment of these systems is of utmost importance. The analysis of such systems using state space approach is better than that of using classical control approach.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	0	70	30	0	0	100	

Content:

Sr. No.	Content	Total Hrs
1	State variable representations of systems, transfer function and transfer function matrix, solutions of state equations	8
2	Observability and controllability, minimal realization of MIMO systems, analysis of linear time varying systems, the concepts of stability	8
3	Lyapunov stability analysis, Lyapunov function and its properties, controllability by state variable feedback	8
4	Ackerman's Formula - stabilisation by output feedback, asymptotic observers for state measurement, observer design	6
5	State space representation of discrete systems, solution of state equations, controllability and observability stability analysis using Lyapunov method	6
6	State feedback of linear discrete time systems, design of observers - MATLAB Exercises	8



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Reference Books:

1. Thomas Kailath, "Linear Systems", Prentice Hall Inc., Englewood Cliffs, N.J. 1980.
2. K. Ogata, "State Space Analysis of Control Systems", Prentice Hall Inc., Englewood Cliffs, N.J., 1965.
3. K. Ogata, "Modern Control Engineering, (second edition)", Prentice Hall Inc., Englewood Cliffs, N.J., 1990
4. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997
5. C.T. Chen, "Linear System Theory and Design", New York: Holt Rinehart and Winston, 1984
6. R.C. Dorf, and R. T. "Bishop, Modern Control Systems", Addison Wesley Longman Inc., 1999.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To learn linear system modeling, analysis and design so as to obtain the ability to apply the same to engineering problems in a global perspective	25
CO-2	Knowledge on carrying out detailed stability analysis of both linear and nonlinear systems	25
CO-3	Design observers and controllers for linear systems	20
CO-4	Acquire knowledge of discrete time linear systems modeling, analysis and design	15
CO-5	Develop and utilize modern software tools for analysis and design of linear continuous and discrete time systems	15

List of Open Source Software/learning website: SCILAB or its equivalent,

MATALB is preferable.