SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

Accredited by NBA, AICTE, NEW DELHI • Accredited by NAAC with "A" Grade – 3.32/4.00 CGPA

Recognized by UGC Under Sections 2(f) & 12 (B) of UGC Act 1956

Approved by AICTE, New Delhi, Permanent Affiliated to JNTU K, Kakinada

Seetharampuram, NARSAPUR-534 280, W.G-Dist., Andhra Pradesh

Department of Electrical and Electronics Engineering

TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods/ Week	Academic Year	Date of Commencement of Semester
23EE4T04	Linear Control Systems	B.Tech / IV	ECE	6	2024-2025	15/12/2025

Course Outcomes: *After successful completion of this course, students should be able to:*

1	Classify control systems and represent in various models (K2)
2	Apply standard test signals to a system to determine their characteristics (K3).
3	Make use of stability concepts to obtain the desired characteristics (K3)
4	Determine the characteristics of a linear control system using various time and frequency domain tools (K5)
5	Design Lag, Lead, Lag-Lead compensators to improve system performance (K6)

Unit	Outcome/ Bloom's Level	Topics No.	Topics/ Activity	TextBook / Reference	Contact Hour	Delivery Method/ LMS
I		1.	INTRODUCTION			
		1.1	Introduction to control systems	T1,R1	1	PPT
		1.2	Open Loop and Closed Loop control systems and their differences	T1,R1	1	PPT
		1.3	Examples of control systems	T1,R1	1	PPT
	CO1: Classify control systems and represent in various models (K2)	1.4	Feedback Characteristics	T1,R1	1	Chalk & Talk
		1.5	Mathematical modeling of control systems	T1,R1	1	Chalk & Talk
		1.6	Differential equation and transfer function of electrical networks	T1,R1	1	Chalk & Talk
		1.7	Problem solving	T1,R1	1	Chalk & Talk
		1.8	Translational Rotational systems	T1,R1	1	Chalk & Talk
		1.9	Problem solving	T1,R1	1	Chalk & Talk
		1.10	Mechanical Rotational systems	T1,R1	1	Chalk & Talk
		1.11	Problem solving	T1,R1	1	Chalk & Talk
Content beyond syllabus (if need)						
Total					11	
II	CO2: Apply	2.TRANSFER FUNCTION REPRESENTATION & TIME RESPONSE				

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	standard test signals to a system to determine their characteristics (K3).	ANALYSIS				
		2.1	Introduction to Servo motor.	T1,R2	1	PPT
		2.2	Transfer Function of AC Servo motor	T1,R2	1	PPT
		2.3	Transfer Function of armature controlled DC Servo motor	T1,R2	1	PPT
		2.4	Transfer Function of field controlled DC Servo motor	T1,R2	1	PPT
		2.5	Problem solving	T1,R2	1	PPT
		2.6	Synchros	T1,R2	1	PPT
		2.7	Block Diagram Reduction Techniques,	T1,R2	1	Chalk & Talk
		2.8	Problem solving	T1,R2	1	Chalk & Talk
		2.9	Representation by Signal Flow Graph	T1,R2	1	Chalk & Talk
		2.10	Reduction Using Mason's Gain Formula	T1,R2	1	Chalk & Talk
		2.11	Problem solving	T1,R2	1	Chalk & Talk
		2.12	Standard test signals and Time response of first order systems	T1,R2	1	Chalk & Talk
		2.13	Characteristic Equation of Feedback control systems	T1,R2	1	Chalk & Talk
		2.14	Transient response of second order systems	T1,R2	2	Chalk & Talk
		2.15	Time domain specifications	T1,R2	1	Chalk & Talk
		2.16	Steady state errors and error constants	T1,R2	1	Chalk & Talk
		2.17	Problem solving	T1,R2	1	Chalk & Talk
Content beyond syllabus (if need)						
Mini Project (if possible)						
Total					18	
III	CO3: Make use of stability concepts to obtain the desired	3. STABILITY ANALYSIS IN S-DOMAIN				
		3.1	The concept of stability	T3,R1	1	Chalk & Talk
		3.2	Routh's stability criterion	T3,R1	2	Chalk & Talk

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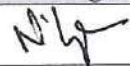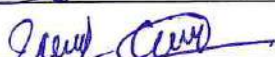|						
characteristics (K3)	3.3	qualitative stability and conditional stability	T3,R1		1	Chalk & Talk
	3.4	limitations of Routh's stability	T3,R1		1	PPT
	3.5	Problem solving	T3,R1		1	Chalk & Talk
	3.6	The root locus concept	T3,R1		1	Chalk & Talk
	3.7	construction of root loci	T3,R1		2	Chalk & Talk
	3.8	effects of adding poles and zeros to G(s) H(s) on the root loci.	T3,R1		1	Chalk & Talk
	3.9	Problem solving.	T3,R1		2	Chalk & Talk
Content beyond syllabus (if need)						
				Total	12	
IV		4. FREQUENCY RESPONSE ANALYSIS				
CO4: Determine the characteristics of a linear control system using various time and frequency domain tools (K5)	4.1	Introduction	T2,R1, R2		1	Chalk & Talk
	4.2	Correlation between time and frequency response	T2,R1, R2		1	PPT
	4.3	Bode plot	T2,R1, R2		2	Chalk & Talk
	4.4	Polar plot	T2,R1, R2		2	Chalk & Talk
	4.5	Nyquist Stability Criterion	T2,R1, R2		2	Chalk & Talk
Content beyond syllabus (if need)						
				Total	8	
V		5. CLASSICAL CONTROL DESIGN TECHNIQUES				
CO5: Design Lag, Lead, Lag-Lead compensators to improve system performance (K6).	5.1	Introduction to compensators	T2,R1, R2		1	Chalk & Talk
	5.2	Design of Lag Compensators	T2,R1, R2		1	PPT
	5.3	Design of Lead Compensators	T2,R1, R2		1	PPT
	5.4	Lag-Lead Compensators	T2,R1, R2		1	Chalk & Talk
	5.5	PID Controllers	T2,R1, R2		1	Chalk & Talk
	5.6	Concepts of State, State Variables and State Model	T1,T2, R1		2	Chalk & Talk
	5.7	State Space Representation of Transfer Function	T1,T2, R1		2	PPT

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		5.8	derivation of state models from block diagrams	T1,T2, R1	2	Chalk & Talk
		5.9	Diagnolisation	T1,T2, R1	2	Chalk & Talk
		5.10	State Transitions Matrix and Its Properties	T1,T2, R1	1	Chalk & Talk
		5.11	Problem solving	T1,T2, R1	1	Stud. Seminars
		5.12	Concept of Controllability and Observability.	T1,T2, R1	1	Chalk & Talk
		5.13	Problem solving	T1,T2, R1	1	Smart Board
Content beyond syllabus (if need)						
				Total	17	
				Cumulative Proposed Periods	66	

Text Books:

S. No.	Author,Book Title, Edition, Publisher, Year of Publication
1	Kotsuhiko Ogata, Modern Control Engineering, 5th edition, Pearson, 2009
2	Benjamin C.Kuo, Automatic control systems , First edition, McGraw Hill Education, 2018

Reference Books:

S. No	Authors, Book Title, Edition, Publisher, Year of Publication
1	M.Gopal , Control Systems principles and design, 4thEdition ,Tata McGraw Hill education Pvt Ltd, 2012
2	Manik Dhanesh N, ControlSystems, 1st edition ,Cengage publications, 2012
3	I.J.Nagarath and M.Gopal , Control Systems Engineering, 6thEdition, Newage International Publications, 2017.
4	A. NagoorKani , ControlSystems ,5th edition, CBS Publications, 2020
5	A.Anand Kumar, Control Systems Engineering ,standard edition, CBS, 2014

Web Details:

1	https://www.youtube.com/watch?v=xWw7z5QzYgE
2	https://www.youtube.com/watch?v=MIVkzOiFvhI
3	https://youtu.be/4cMHfTsPz3M?list=PLgwJf8NK-2e78NzXFirvPmyRzH_JE53tW
4	https://www.youtube.com/watch?v=xWw7z5QzYgE
5	https://www.youtube.com/watch?v=M8hx5kpSveM
6	https://www.youtube.com/watch?v=64zZ-mDhdtk

		Name	Signature with Date
i.	Course Coordinators	1) Mrs. N. Lavanya	
		2) Dr.V. Madhu	
		3) Mr. Y. Murali Krishna	

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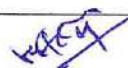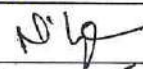## COLLEGE OF ENGINEERING & TECHNOLOGY
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		4) Dr. M. Surendhra	
ii.	Module Coordinator	Mrs. N. Lavanya	
iii.	Programme Coordinator	Mr. A. Satyanarayana	

Principal