



## **DEPARTMENT OF ELECTRICAL ENGINEERING**

**Govt. Polytechnic, Balasore**

**LESSON PLAN FOR ACADEMIC SESSION - 2023-24  
CONTROL SYSTEM ENGINEERING**

Course Code : Th.3	Semester : 6th
Total Periods : 75(60+15) Periods	Examination : 3 Hours
Theory Periods : 4 P/Week	Internal Assessment : 20 Marks
Tutorial : - 1 P/Week	End Semester Examination : 80 Marks
Maximum Marks : 100	
Semester From Date : 16/01/2024 To Date : 08/05/2024	
Name of Teaching Faculty: Er. Radha Rani Panda	

WEEK	PERIOD	TOPIC
1 <sup>st</sup>	1 <sup>st</sup>	<b>FUNDAMENTAL OF CONTROL SYSTEM</b> Classification of Control system Open loop system & Closed loop system and its comparison
	2 <sup>nd</sup>	Effects of Feed back
	3 <sup>rd</sup>	Standard test Signals(Step, Ramp, Parabolic, Impulse Functions)
	4 <sup>th</sup>	Servomechanism
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
2 <sup>nd</sup>	1 <sup>st</sup>	<b>MATHEMATICAL MODEL OF A SYSTEM</b> Transfer Function & Impulse response, Properties, Advantages & Disadvantages of Transfer Function
	2 <sup>nd</sup>	Poles & Zeroes of transfer Function
	3 <sup>rd</sup>	Simple problems of transfer function of network.
	4 <sup>th</sup>	Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
3 <sup>rd</sup>	1 <sup>st</sup>	<b>CONTROL SYSTEM COMPONENTS</b> Components of Control System Gyroscope,
	2 <sup>nd</sup>	Synchros, Tachometer
	3 <sup>rd</sup>	DC servomotors
	4 <sup>th</sup>	Ac Servomotors
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
4 <sup>th</sup>	1 <sup>st</sup>	<b>BLOCK DIAGRAM ALGEBRA &amp; SIGNAL FLOW</b>

		<b>GRAPHS</b> Definition: Basic Elements of Block Diagram Canonical Form of Closed loop Systems
	2 <sup>nd</sup>	Rules for Block diagram reduction
	3 <sup>rd</sup>	Procedure for of Reduction of Block Diagram
	4 <sup>th</sup>	Simple Problem for equivalent transfer function
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
5 <sup>th</sup>	1 <sup>st</sup>	Basic Definition in Signal Flow Graph & properties
	2 <sup>nd</sup>	Construction of Signal Flow graph from Block diagram
	3 <sup>rd</sup>	Mason's Gain formula
	4 <sup>th</sup>	Simple problems in Signal flow graph for network
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
6 <sup>th</sup>	1 <sup>st</sup>	<b>TIME RESPONSE ANALYSIS.</b> Time response of control system. Standard Test signal. Step signal,
	2 <sup>nd</sup>	Ramp Signal Parabolic Signal Impulse Signal
	3 <sup>rd</sup>	Time Response of first order system with: Unit step response Unit impulse response
	4 <sup>th</sup>	Time response of second order system to the unit step input. Time response specification. Derivation of expression for rise time
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
7 <sup>th</sup>	1 <sup>st</sup>	Derivation of expression for peak time, peak overshoot, settling time and steady state error
	2 <sup>nd</sup>	Steady state error and error constants
	3 <sup>rd</sup>	Types of control system.[ Steady state errors in Type-0, Type-1]
	4 <sup>th</sup>	Steady state errors in Type-2 system] Effect of adding poles and zero to transfer function.
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing, Numericals and revision class</b> )
8 <sup>th</sup>	1 <sup>st</sup>	Response with P, PI controller
	2 <sup>nd</sup>	Response with PD and PID controller
	3 <sup>rd</sup>	<b>ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE.</b> Root locus concept
	4 <sup>th</sup>	Construction of root loci.
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing, Numericals and revision class</b> )
9 <sup>th</sup>	1 <sup>st</sup>	Construction of root loci..
	2 <sup>nd</sup>	Rules for construction of the root locus.
	3 <sup>rd</sup>	Rules for construction of the root locus.
	4 <sup>th</sup>	Problems related to Root Locus
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
10 <sup>th</sup>	1 <sup>st</sup>	Problems related to Root Locus
	2 <sup>nd</sup>	Effect of adding poles and zeros to G(s) and H(s).
	3 <sup>rd</sup>	Problems related to Root Locus
	4 <sup>th</sup>	Problems related to Root Locus
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
11 <sup>th</sup>	1 <sup>st</sup>	<b>FREQUENCY RESPONSE ANALYSIS.</b>

	2 <sup>nd</sup>	Correlation between time response and frequency response Polar plots.
	3 <sup>rd</sup>	Problems related to Polar plots.
	4 <sup>th</sup>	Bode plots.
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
	12 <sup>th</sup>	1 <sup>st</sup>
	2 <sup>nd</sup>	All pass and minimum phase system.
	3 <sup>rd</sup>	Computation of Gain margin and phase margin.
	4 <sup>th</sup>	Problems related to computation of Gain margin and phase margin
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
	13 <sup>th</sup>	1 <sup>st</sup>
	2 <sup>nd</sup>	Closed loop frequency response.
	3 <sup>rd</sup>	<b>NYQUIST PLOT</b> Principle of argument
	4 <sup>th</sup>	Nyquist stability criterion.
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
	14 <sup>th</sup>	1 <sup>st</sup>
	2 <sup>nd</sup>	Niquist stability criterion applied to inverse polar plot.
	3 <sup>rd</sup>	Problems related to inverse polar plot.
	4 <sup>th</sup>	Effect of addition of poles and zeros to G(S) H(S) on the shape of Niquist plot
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )
	15 <sup>th</sup>	1 <sup>st</sup>
	2 <sup>nd</sup>	Constant M circle
	3 <sup>rd</sup>	Constant N circle
	4 <sup>th</sup>	Nicholas chart.
	5 <sup>th</sup>	Tutorial ( <b>Doubt clearing and revision class</b> )

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16/01/2024

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