LESSON PLAN FOR CONTROL SYSTEM (Th. 3)

Discipline: Electrical Engineering	**Semester: 6th**	**Name of the Teaching Faculty: CHANDRAMANI MAHAPATRA (Lect.)**
Subject: CONTROL SYSTEM	**No. of days per week class allotted: 5**	**Semester From Date : 10/03/2022 To Date: 10/06/2022.** **No. of Weeks: 13**
Week	**Class Day**	**Theory**
1st		**1. FUNDAMENTAL OF CONTROL SYSTEM**
	1st	1.1. Classification of Control system
	2nd	1.2. Open loop system & Closed loop system and its comparison
	3rd	1.3. Effects of Feed back
	4th	1.4. Standard test Signals(Step, Ramp, Parabolic, Impulse Functions)
	5th	1.5. Servomechanism [Tutorial]
		2. MATHEMATICAL MODEL OF A SYSTEM
2nd	1st	2.1. Transfer Function & Impulse response, 2.2. Properties, Advantages & Disadvantages of Transfer Function
	2nd	2.3. Poles & Zeroes of transfer Function
	3rd	2.4. Simple problems of transfer function of network.
	4th	2.5. Mathematical modeling of Electrical Systems(R, L, C, Analogous systems)
	5th	**3. CONTROL SYSTEM COMPONENTS** 3.1. Components of Control System [Tutorial]
3rd	1st	3.1. Components of Control System (Continue)
	2nd	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors.
	3rd	3.2. Gyroscope, Synchros, Tachometer, DC servomotors, Ac Servomotors. (Continue)
	4th	**4. BLOCK DIAGRAM ALGEBRA & SIGNAL FLOW GRAPHS** 4.1. Definition: Basic Elements of Block Diagram 4.2. Canonical Form of Closed loop Systems
	5th	4.3. Rules for Block diagram reduction 4.4. Procedure for of Reduction of Block Diagram [Tutorial]
4th	1st	4.5. Simple Problem for equivalent transfer function
	2nd	4.6. Basic Definition in Signal Flow Graph & properties
	3rd	4.7. Construction of Signal Flow graph from Block diagram
	4th	4.8. Mason‘s Gain formula
	5th	4.9. Simple problems in Signal flow graph for network [Tutorial]
5th	1st	**5. TIME RESPONSE ANALYSIS.** 5 . 1 Time response of control system.

	2nd	5 . 2 Standard Test signal. 5.2.1. Step signal, 5.2.2. Ramp Signal 5.2.3. Parabolic Signal 5.2.4. Impulse Signal
	3rd	5 . 3 Time Response of first order system with: 5.3.1. Unit step response 5.3.2. Unit impulse response.
	4th	5 . 4 Time response of second order system to the unit step input. 5.4.1. Time response specification.
	5th	5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error. [tutorial]
6th	1st	5.4.2. Derivation of expression for rise time, peak time, peak overshoot, settling time and steady state error. (continue)
	2nd	5.4.3. Steady state error and error constants.
	3rd	5 . 5 Types of control system.[Steady state errors in Type-0, Type-1, Type-2 system]
	4th	5 . 6 Effect of adding poles and zero to transfer function.
	5th	5 . 7 Response with P, PI, PD and PID controller. [Tutorial]
7th	1st	5 . 7 Response with P, PI, PD and PID controller. (continue)
	2nd	**6. ANALYSIS OF STABILITY BY ROOT LOCUS TECHNIQUE.** 6 . 1 Root locus concept.
	3rd	6 . 2 Construction of root loci.
	4th	6 . 2 Construction of root loci. (cont.)
	5th	6 . 2 Construction of root loci. (solve Problem) [Tutorial]
8th	1st	6 . 3 Rules for construction of the root locus.
	2nd	6 . 3 Rules for construction of the root locus.(cont.)
	3rd	6 . 4 Effect of adding poles and zeros to G(s) and H(s).
	4th	6 . 4 Effect of adding poles and zeros to G(s) and H(s). (cont.)
	5th	Tutorial
		7. FREQUENCY RESPONSE ANALYSIS.
9th	1st	7 . 1 Correlation between time response and frequency response.
	2nd	7 . 2 Polar plots.
	3rd	7 . 2 Polar plots. (Solve problem)
	4th	7 . 3 Bode plots.
	5th	Tutorial
10th	1st	7 . 3 Bode plots. (cont.)
	2nd	7 . 3 Bode plots. (Solve problem)
	3rd	7 . 4 All pass and minimum phase system.
	4th	7 . 5 Computation of Gain margin and phase margin.
	5th	Tutorial
11th	1st	7 . 6 Log magnitude versus phase plot.
	2nd	7 . 7 Closed loop frequency response.
		8. NYQUIST PLOT
	3rd	8.1 Principle of argument.

	4th	8.2 Nyquist stability criterion.
	5th	Tutorial
12th	1st	8.3 Niquist stability criterion applied to inverse polar plot.
	2nd	8.4 Effect of addition of poles and zeros to G(S) H(S) on the shape of Niquist plot.
	3rd	8.4 Effect of addition of poles and zeros to G(S) H(S) on the shape of Niquist plot. (cont.)
	4th	8.5 Assessment of relative stability.
	5th	Tutorial
13th	1st	8.6 Constant M and N circle
	2nd	8.6 Constant M and N circle (cont.)
	3rd	8.7 Nicholas chart.
	4th	8.7 Nicholas chart. (cont.)
	5th	Tutorial